THE

ELECTRICAL REVIEW.

VOL. LXX. JUNE 21, 1912. No. 1,804.

ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

Published every FRIDAY, Price 4d.

The Oldest Weekly Electrical Paper. *Established 1872.*

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos.: Holborn 933; Central 4425 (Editorial only).

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Binding.—Subscribers' numbers bound, including case, for 4s. each volume.

Cases.—Cloth cases for Binding, 2s. 6d. each; post free, 2s. 9d.

Foreign Agents.—New York: D. VAN NOSTRAND, 23, Murray Street. Toronto, Ont.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOIVEAU AND CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London) to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. Berly's).

1912 EDITION.

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill London, E.C.

THE I.M.E.A. PRESIDENTIAL ADDRESS.

IN his address to the seventeenth annual convention of the Municipal Electrical Association, delivered at Harrogate on Tuesday of this week, Mr. George Wilkinson takes a brief survey of the history of the development of electricity supply, and indicates directions in which further developments may, in the future, be profitably made.

The address is couched in that lucid and graceful language which, although one may not always agree with his opinions, always makes it a pleasure to listen to Mr. Wilkinson's contributions to discussions at the meetings, both of the Incorporated Municipal Electrical Association and of the Institution of Electrical Engineers. Our readers will remember that, in the past, Mr. Wilkinson has turned his attention to various details of electrical work, and has brought out several ideas, some more successful than others, but all ingenious. Thus we are assured beforehand that an address penned by him will make interesting reading.

Turning from the address as a whole to the constituent parts of it, we are afraid that Mr. Wilkinson is a little oversanguine when he says that "gas for internal illumination need no longer be regarded as a serious competitor in new districts." If this is the case in Harrogate, it must be very encouraging for the electricity undertaking, but it is not true in every case; nor, indeed, in the majority of cases. To take the not far distant city of Sheffield, for example, the price of gas is, as most people are aware, very low—1s. 3d. per 1,000 cb. ft. It is not even yet an easy matter to induce landlords to wire new houses, nor to ensure that, if they do so, all the tenants will use electricity at 4d. per unit for lighting. Any electricity supply authority where the price of gas is below 2s. per 1,000 cb. ft. is confronted with very serious competition in obtaining each new consumer.

Mr. Wilkinson's experience in the direction of street lighting, and with service cables of special design, is familiar to those who have read his papers presented to the I.E.E. After touching upon these points, he goes on to demonstrate that as metal lamps are much less responsive to voltage fluctuations than carbon lamps, the Board of Trade Regulations as to pressure variation might be relaxed in the ratio of, say, from four to six, thereby enabling some 50 per cent. more revenue to be obtained from the existing low-pressure mains.

Publicity and advertising are next dealt with, and we are reminded that the gas industry also is not standing still in this matter. All electricity supply authorities should give their whole-hearted support to this campaign, and support should come not only from the heart, but from the pocket. Reference is made to the I.M.E.A. Bill for wiring powers which was before Parliament until a few days ago. Opinions vary as to the merits of the proposal to give wiring powers to all municipalities. Mr. Wilkinson rightly says that "one of the greatest evils from which the *bona fide* contractor, and also the public, suffer, is that any person or small firm, regardless of training or fitness, is at liberty to start business as an electrical engineer and contractor." This

is truly a serious matter, and has been the subject of frequent comment, but nothing in the way of improving matters has been done by any of the bodies interested—the I.E.E., the B.E.A.M.A., or the E.C.A. It should be made impossible for any person to engage in electrical work without having passed the examination, corresponding to his age, of the Institution, and it should be compulsory for every electrical contracting firm to be registered, and capable of being guaranteed by the association registering it.

Power house economies next engage Mr. Wilkinson's attention, and we are far from wishing even to seem to detract from the importance of running the boiler house and engine room in the most efficient way. It has, however, been pointed out over and over again, that whereas the practicable economies in the power house are represented by a fraction of a penny per unit, careful distribution and—notably—the use of accurate meters and of care in maintaining them in an accurate condition, increase the revenue by several pence for every unit recovered. This matter receives no attention at all in this address. Indeed, the only reference to meters is contained in Mr. Pearce's paper, to which we shall refer in another article.

National power houses ought, Mr. Wilkinson thinks, to be erected on the coalfields. In this connection Mr. Highfield's paper, read at the Glasgow meeting of the I.E.E. last week, is interesting. Mr. Wilkinson hopes, as all must hope, for the coming of the large gas turbine. In the meantime he points out an opening for money-making in the sale of low-pressure steam. This is done in America to some extent, and gives better financial results than the expenditure of large amounts of capital on cooling towers and condensing plant.

The address contains much food for thought, and although presidential addresses are not open for formal discussion, we have no doubt that it will receive a great deal of attention among the members of the Association.

The King's English.

We think it was one of the books of the "Wisdom While You Wait" series in which we found the remark: "Letters in the third person are more dignified, but they want watching." We are forcibly reminded of this need for watchfulness by the perusal of the I.M.E.A. papers. For reasons best known to itself the Council directs that all papers shall be written in the third person. The presidential address is allowed to be exempt, and the I.E.E. does not make any such stipulation. Of course, it is best to write impersonally, but this is not so easy. The references to "the author," "he" and "him" are miserable reading, and very often "the author" has been left pages behind when we reach the "he." Why cannot the I.M.E.A. allow the use of the first person? It would simplify matters considerably, and do no harm at all. There is an Editing Committee, but we suppose it does not condescend to deal with the literary merits of the papers. It certainly does not excise split infinitives and "and whiches." If the engineer of Limerick is asked to know something of Irish history and literature, it is surely not too much to expect that British engineers should write English correctly.

The Waste of Compensation Money.

Prior to the Compensation Act, 1906, it had become apparent that the system of paying lump sums to workmen was inexpedient from the point of view of the workman. He receives an amount which, even if well invested, can only bring in a very small income; and he is, therefore, tempted either to live upon his capital or to buy the goodwill of a business. Cases are frequently reported from which it appears that the workman who proposes to set up in business is generally misled as to the purchase price, and hopelessly fails to understand the business into which he is suddenly plunged. In a case recently heard at Sheffield, a workman who had received a sum of £170 by way of compensation for an accident, purchased a greengrocer's round, including a horse and dray, for £35. This turned out to be nothing but a hawking business, which was a hopeless failure. His next venture was the purchase of a greengrocer's shop for £70, from which the vendor represented he was making a profit of £6 a week. He brought an action against this vendor for misrepresentation, but lost the action, and finally returned to work with his old employer. It was for the protection of workmen who squander their money in this fashion that the County Court Judges were authorised by the Act of 1906 to retain a lump sum and pay it out by instalments; but it is surprising what pressure is brought upon County Court Judges to make payment of a lump sum. We recall a case where a workman, to whom an employer was under no legal obligation, had a choice of accepting £30 down or a pension of 25s. a week. He actually chose the lump sum, and spent it in about a month!

The I.M.E.A. Bill.

On Monday last, after having passed through the initial stages, the "Further Powers" Bill promoted by the Municipal Electrical Association came to an untimely end; it was, in fact, abandoned. No one, we think, who is interested in the electrical industry can do other than deplore the time, money and effort expended upon this ill-fated movement by promoters and opponents alike, more especially as, we believe, a reasonable compromise was within measurable distance of attainment. Agreement is essentially more permanent and satisfactory than compulsion in any form, and it would be far better for all parties if they resolved to permit no obstacle to prevent its achievement.

We cannot regard with favour the institution of wiring departments by electricity works in general; it may be contended that the larger undertakings can find continuous employment for the staff, and conduct the department on a commercially sound basis—though Woolwich is a notoriously disastrous warning to the contrary—but certainly small undertakings cannot hope to make a success of such a business; and not a few central station managers who possess the necessary powers prefer to leave them dormant and to do the work through contractors.

On the other hand, contractors in general do not wish, and cannot afford, to stock motors and other apparatus for hiring-out, whereas the electricity works can do this at cost, and reap their profit on the supply of energy, the policy which has proved so lucrative to the gas companies. Why, then, cannot the wiring be allotted to the contractors and the hiring to the supply authorities? An agreement on these lines ought not to present any great difficulties—it only calls for co-operation in place of competition.

In the meantime, great harm is being done to the industry by this continual strife, which, like most domestic quarrels, is based rather upon obstinacy and misunderstanding than upon any just grounds for contention.

The Benevolent Institution.

We have received from the secretary of the Electrical Trades Benevolent Institution one of the collecting books suggested at the recent Festival, which should prove a valuable means of raising funds for the worthy objects of the Institution. Not only has the user the gratifying consciousness of *doing something* to aid the cause of charity, and that without cost to himself, but he also has the satisfaction of knowing that if he succeeds in collecting 10 guineas in one year, he becomes a Life Subscriber, with a vote, while if he succeeds in obtaining only £5, he is entitled to membership for one year. Thus he earns the right to a pension, should he fall on evil days. We earnestly commend this offer to the notice of our readers; there must be few establishments of any size in which 10 guineas cannot be got together in 12 months, especially if the donors be persuaded to contribute small sums at stated intervals; we may suggest, too, that where a number of persons combine on such a basis to make up the required sum by periodical payments, they be allowed to ballot for the life subscribership. Thus, nine men each paying 6d. a week would cover the amount without feeling the burden, with the certainty that one of them would receive the reward at the end of the year, and this would enlist the interest of the whole of the subscribers, instead of one only. The collecting-books can be obtained from the Secretary, 18, Park Mansions, Vauxhall Park, S.W.

THE I.M.E.A. CONVENTION, 1912.

THE seventeenth Annual Convention of the I.M.E.A. was opened at Harrogate on Tuesday, when the Mayor, Councillor J. S. Rowntree (who is also a member of Council of the I.M.E.A.), welcomed a numerous attendance of members and visitors in the Kursaal. He said that he saw they had a number of interesting papers to discuss, and he hoped they would do all in their power to ensure that heating and cooking by electricity would out-distance rival methods and truthfully appeal to all.

The thanks of the President, Mr. Geo. Wilkinson, and of Bailie Willock having been duly accorded, Mr. Wilkinson read his presidential address, an abstract of which we print herewith. This was followed by a discussion (initiated by Mr. Frank Ayton) on "Means for Securing Reliability and Maintaining Continuity of Electricity Supply."

Mr. Ayton's remarks drew many expressions of opinion from fellow engineers, which left no doubt as to the necessity for adequately fusing mains networks, with a view to isolating faulty sections, but which also voiced the necessity of carrying out the work with discrimination. The feeder pillar received general approval, indeed, its advantages obviously outweigh anything which can be claimed for the pavement box.

The coal strike found an echo in the discussion, and has evidently served at least one useful purpose in reminding the engineer of the paramount importance of the coal pile and the storage possibilities of oil fuel.

After the luncheon adjournment, the meeting was resumed at the Hotel Majestic, when a lengthy discussion ensued on the papers by Mr. F. M. Long, on "A Cooking Load from the Supply Station Point of View," and by Mr. H. H. Holmes on "Electrical Cooking and Cooking Apparatus."

Mr. Long's paper introduced the question of something in the nature of a ½d. tariff, and while the great majority of those present were apparently sceptical as to the practicability of such a low price being remunerative, it is noteworthy that about a dozen engineer enthusiasts have courageously adopted the ½d. per unit rate for cooking—both with and without a fixed initial charge—and as they are perfectly satisfied with the results obtained, it is not unlikely that many others will follow suit. Whether as low a rate as ½d. is material or not, it can scarcely be denied that its fairly general introduction will give an enormous impetus to electrical cooking, and it will then only remain for the maker of cooking apparatus to bring its cost down to reasonable and competitive proportions.

The discussion, so far as Mr. Holmes's paper was concerned, consisted mainly in a refutation of many of his remarks on stove construction by Mr. Grogan, who, of course, represents the "Tricity" interests, and, it must be admitted, speaks from long experience both as a user and maker.

The question of the "bright" as against the "insulated" stove claimed attention; while, in order to get over first cost difficulties, Mr. J. Christie suggested that surplus moneys, instead of going to rate relief, should be diverted to the purchase of cooking outfits, which, from his experience, would provide an excellent load if let out at the low rentals which would then be possible.

The discussion would, no doubt, have drawn many other speakers had time permitted, as there is much evidence that electric cooking is gaining support in every direction, only the lack of reliable information being a bar to more rapid progress.

In the evening a reception was held in the Royal Spa Rooms by invitation of the Mayor and Mayoress, and both this and the concert which followed were largely attended by the visitors.

On Wednesday the Association met at the Albert Hall, Leeds, being welcomed by Alderman Brown, chairman of the Electricity Committee, in the absence of the Lord Mayor. Mr. S. L. Pearce read his paper on "Limitation of Rate Relief from Profits," and the discussion was opened by Alderman Bruce. The general trend of his and other speakers' remarks was unfavourable to the policy of rate relief from trading profits. Alderman Smith, of Liverpool, was a notable exception. The discussion was naturally an attractive one to the Council representatives, who nearly all deprecated Parliamentary interference. Mr. C. M. Shaw's paper on "Organisation in Electrical Supply Undertakings" was then read before a depleted audience. Only a brief discussion followed. Mr. Shawfield said that it described the practice in vogue in vast American stations, adding, amidst applause, that all electricity supply accountancy should be in the hands of the electricity departments. Bailie Willock, Councillor Crowther and Alderman Smith, of Liverpool, continued the discussion, and Mr. Shaw briefly replied.

Presidential Address.

By MR. GEORGE WILKINSON, Chief Electrical Engineer, Harrogate.

THE last few years have seen a conspicuous change in the duties of the municipal electrical engineer. In the earlier years of the industry, his chief concern was to see that the capacity of his generating plant increased at approximately the same rate as the demand. Little, if any, effort was necessary to obtain consumers, and the field of operation was rendered attractive by the presence of considerable numbers of comparatively large consumers. At a later stage, the convenience and adaptability of the electric motor for industrial work were recognised, and, in due course, conversion of horse tramways into electric tramroads gave another impetus to the business. A few years ago, due to the introduction of the gas mantle, it looked as if the gas authorities would regain a part of the lighting business. The advent of the metal electric lamp has, however, effectively neutralised any tendency of this kind, and gas for internal illumination need no longer be regarded as a serious competitor in new districts, nor in better-class areas where electricity supply is available.

With regard to street lighting, in the main thoroughfares of our larger cities, the old standard of lighting has become insufficient. In such thoroughfares, improvements call for the introduction of high-pressure gas lighting or flame arc lamps. In cases where access can be had to the accounts, it is found that flame arc lighting compares favourably with pressure-gas lighting, both in capital cost and maintenance, while the lighting effect is emphatically in favour of the electric lamp.

For side-street lighting, where the local authority controls both the gas and electricity undertakings, the economy of changing from the old illuminant to the new, excepting in new streets, has, I think, yet to be demonstrated. Examples of such conversions from gas to electric lighting may be seen in many streets in Harrogate. Out of a total number of 2,300 ordinary posts in the side streets, 650 have already been taken over and converted by the Electricity Department, at an average cost of 32s. per post, including all charges. The metal lamps are maintained by the lamp manufacturers at a fixed price per post per annum, and the cost of the lamp per annum, including lamp renewals, is the same as is paid for gas, excluding renewals.

As regards service cables, the minimum size allowed, under the latest revised regulations, at 1,000 amperes per square inch, has a carrying capacity of 7 amperes. At 200 volts such a service cable is capable of carrying 1·4 KW.

This regulation has for many years caused an extravagant waste of copper, and with metal-filament lamps the case is much worse.

One reason given for insisting on large service cable is the plea that conductors of smaller sectional area are mechanically weak. This is not so if such cables are made with the lead and return conductors arranged concentrically and enclosed in a lead tube.

For services to small properties, cottages and the like, the Harrogate Corporation have obtained the Board of Trade's permission to use concentric lead-covered cable consisting of 7/22 inner conductor, with an approximately equivalent section in the outer made up of 39/30 S.W.G. copper. For services to street lamps in side streets, permission is also granted to use a concentric lead-covered cable having a single No. 18 S.W.G. inner conductor with an equivalent aggregate section in the outer made up of No. 30 S.W.G. copper strands. The copper contained in these services is ample for all practical purposes. To prevent strain on them they are laid in wrought-iron tubing.

One valuable feature of this street lamp cable is that in no case can it develop a short-circuit on the distribution mains. On short-circuiting the service cable, the 1/18 inner conductor has, in every case, volatilised and disappeared, at once locating the fault.

The early modification of the Government Regulation with regard to service cables is a task to which I think this Association may with advantage address itself.

The clause in the Board of Trade Regulations relating to the permissible variation in electrical pressure at consumers' terminals has an important bearing upon the cost of distribution, and it is, in my opinion, another matter that calls for attention on the part of this and kindred associations.

A 4 per cent. + or − variation of electrical pressure on 200 volts, in terms of candle-power variation, is shown by the following table. In the same table is given the + and − electrical

pressure variation, which gives—within close limits—the same variation of candle-power in a 200-volt metal-filament lamp (tungsten):—

Carbon-Filament Lamp.	Volts.	C.P.	Metal-Filament Lamp (Tungsten).	Volts.	C.P.
4 % − pres. variation	192	33·6	7 % − pres. variation	186	32·7
	200	44·4		200	44·4
4 % + pres. variation	208	59·4	7·5 % + pres. variation	215	57·9

These figures show that for the same variation in light with metal lamps, the pressure variation may be increased approximately in the ratio of 4 to 6. The Official Regulations should be modified accordingly. Such modification will allow supply authorities to earn 50 per cent. more revenue without additional expenditure on L.P. mains, provided the increased load is imposed with approximate uniformity.

A leading feature in the management of supply undertakings in recent years has been the inauguration of a publicity and advertising campaign. In this connection much useful work has been done by the Electric Supply Publicity Committee.

At present the members consist exclusively of representatives from the metropolis and the south, and I venture to suggest that representatives from other parts of the country might be placed on the executive with advantage to all concerned.

With the same object in view and in the interests of a competitive industry, the Institution of Gas Engineers in the autumn of last year launched a new association called "The British Commercial Gas Association." This movement is apparently receiving strong support, and should be met by increased activity on the part of the electrical industry. With this end in view, there should be a closer alliance between all branches of the profession, including supply authorities, manufacturers and contractors.

The Further Powers' Bill appears to have met with favour from all branches of the industry, excepting from the wiring contractors, who, rightly or wrongly, look with alarm to the time when municipal authorities shall have powers comparable with those long enjoyed by the gas authorities.

It is difficult to see on what grounds Parliament can deny to certain municipal authorities what they have already granted to others. There is no doubt that when the Bill becomes an Act it will prove of substantial benefit to contractors as well as to the other interested parties.

The local contractors whose businesses were built up on the big wiring contracts cannot afford to canvass and develop a business in fitting up small properties—it does not pay; but when the Bill becomes law it will pay the supply authority to develop these large areas which, under existing conditions, it does not pay the electrical contractor to exploit, and, in turn, the contractor will benefit by carrying out the work on fair terms under the control and supervision of the supply authority.

On the question of economies in the generating station, the author points out that it is standard practice in some of our largest works to pass the same amount of cooling water through the condensers, irrespective of the load on the plant. The temperature of the condensed steam on a vacuum of 28 in. ought not to be below 95° F., and the amount of cooling water passed through the condenser should be regulated in accordance with the readings of a thermometer, so as to maintain the outlet temperature practically uniform under all variations of load.

The approximate value of 10° F. in the water being equal to 1 per cent. saving in fuel, recorded emission temperatures of 79° and 69° F. represent a coal loss of 1½ per cent. at full load and 2½ per cent. at half load.

Another loss easily avoidable is due to employing a hot well or feed-tank of too large a capacity.

Careful consideration will show that feed-water should be no hotter than the discharge temperature from the condensers, and in cases where there are no condensers the water in the feed-tank should be cold. The necessary minimum initial temperature of the feed-water passed through the economiser can be obtained by connecting a small pipe from the hot end of the economiser to the suction of the feed-pump. Actual experiments have proved that by this re-arrangement the economiser efficiency can easily be raised 10 per cent., which means a saving of approximately 1 per cent. in fuel.

It needs no argument to prove that steam-traps are exceedingly wasteful; if they are used at all, they should be of a type where the water, having once formed, remains quiescent during discharge with a small upper surface only exposed to the heating action of the steam.

It is satisfactory to note that the production of boiler furnace draught by means of hot gases ascending tall chimneys is on the wane, and the much more economical fan draught is being substituted, whereby the heat losses from the spent gases may often be halved.

Recent inquiries have revealed the astonishing amount of make-up feed water required in present day power houses. If water had been an expensive commodity, measures would have been taken long ago to curtail its use, with a corresponding saving in the coal account. Much of the make-up feed is accounted for in blowing-off the boilers, a process which wastes fuel, inasmuch as the water is blown out at full boiler temperature.

If the water put into the boilers were pure at the start, and if all steam evolved from it were put back into the boilers immediately on condensation, there would be no waste of water, no accumulation of scale, and no concentration of salts in the boilers. Blowing off would then be unnecessary. Further, no water-softening or purifying plant would be required.

This condition cannot be actually arrived at in practice, but it can be approximated to much more closely than at present. If all the water from the steam range and separators is taken back to the boilers direct, and if the water from the air pumps of the surface condensers is taken through a closed pipe system, direct into the boilers, extra feed water in very small quantity will be required to make up for the losses by leakage from the steam seals on the turbine shaft-bearings, glands, and the like. Such make-up feed could with advantage and economy be pumped into closed cylindrical tanks, and there raised to the full steam temperature before passing on to the boiler; in these tanks the suspended matter and scale-forming impurities would be deposited, and they could be readily cleaned out when required. As to the gradual concentration of destructive salts or acids in the boilers, we should be able to rely upon the chemist to neutralise these, in a more direct and economical way than by blowing to waste large quantities of high-temperature water from the boilers.

Present day practice does not represent a final solution of the electricity supply problem. The multiplicity of power houses with their respective staffs is not economical.

National power houses, built on the coal fields and on other sites to which coal would be cheaply transported by water, would supply the power for all extensions in existing areas, and would gradually assume the whole of the supply, as the plants in local works became worn out or obsolete. They would also supply power for all industrial purposes and for locomotion, including the railways of the country. Thus the load and diversity factors would be high, with a corresponding beneficial effect in the reduction of costs.

Such power houses would be equipped with high-pressure steam turbo-generators of, say, 25,000 and 50,000 KW. sizes. The power houses would be interconnected and distribution effected at, say, 100,000 volts to sub-stations.

It is the generation of steam that calls for a radical change in present day practice.

The solution appears to lie in the introduction of gas firing, by means of flameless surface combustion on the lines first discovered by Sir Humphrey Davy, and more recently developed and set out by Prof. Bone in his lectures before the Royal Institution of Great Britain in 1911. So far as investigations have gone at present it is shown that an evaporative duty from boilers exceeding 20 lb. of steam per sq. ft. of heating surface can easily be obtained with a thermal efficiency corresponding to the transmission to the water in the boiler of nearly 95 per cent. of the energy represented by the net calorific value of the gas. At a slightly lower efficiency the evaporation may be increased from 20 lb. to 30 lb. of steam per sq. ft. On these high duties the internal boiler surfaces are stated to be self-cleaning, and the scale in thin flakes becomes detached, and is deposited in the bottom of the boiler. The boiler installation would be comparatively small and the steam range short, as all the auxiliaries would be driven by internal-combustion engines.

If in the future a gas turbine of larger power is developed, which proves more efficient than the steam turbine, it can be brought into use without waste of capital, or extensive scrapping of plant.

The manufacture of the gas will take place adjacent to the power-house, and the by-products will form a valuable asset against the cost of gas production.

A national electric power supply on the lines indicated would greatly minimise the disastrous effect of a coal strike, such as the country has recently suffered from. Low-grade fuel could also be profitably employed, which at present is dumped upon the pit banks as useless.

Many of the largest industries in the country, notably the cotton, woollen, dyeing, chemical, distilling and brewing trades, use immense quantities of low-pressure steam in their various manufacturing processes. Steam for such industries could be supplied from the national power-houses at less cost than it can be produced at by the manufacturers themselves.

There are many district steam heating schemes in operation in America, and in numbers of instances the revenue from the heat distribution is larger than that from the sale of electric power.

Means for Securing Reliability and Maintaining Continuity of Supply.

Mr. Frank Ayton (of Ipswich), in introducing the above subject, contributes what is a short and very interesting paper to the practical man, who in these ultra-commercial days is apt to find his time fully occupied with matters other than engineering. The author's remarks are based upon his own experience, and bear on a variety of points in central station and distribution practice.

For instance, experiment at Ipswich has shown that with banked marine boilers of the dry-back type, by making the damper practically an air-tight fit in its frame, and keeping the brickwork air-tight, it is possible to reduce the pressure drop to at most 10 lb. between night and morning, and, moreover, the mere turning-over of the fires after opening the damper suffices in about 20 minutes to bring up the boiler pressure, no extra fuel being used. The hint is worth

considering for those stations where banked boilers are kept in readiness for emergency loads over considerable periods of light load. The author has fitted new dampers of the sliding type to all his boilers.

Next to claim attention is the question of signalling apparatus between driver, switchboard and boiler house. The author favours an electrical arrangement, if energised from a battery, in preference to the ordinary ship telegraph, but in this many engineers will not agree with him, in so far as simplicity and reliability are concerned.

A serious breakdown due to seizing on the engine of a 500-KW. Reavell set was traced to the presence of gritty dust in the funnel top of a cylinder flushing cup, the dust being carried into the cylinder along with the lubricating oil; the author has adopted the obvious remedy of providing protecting covers to cups and lubricators.

Turning to electrical matters, the Ipswich switchboard is provided with a set of battery excitation bus-bars for the generator panels, and links are provided on the latter by means of which the shunt field circuits can be separately excited on emergency occasions—as, for instance, when a reversal of polarity has occurred due to a short. A red board bearing the words "Not excited" is always suspended across the circuit-breakers of dead machines, in order to prevent attendants pulling wrong switches, and the author usefully suggests painting apparatus on adjacent panels different colours, in order to distinguish them.

He discarded nearly nine years ago the usual method of earthing the middle wire by a maximum current circuit-breaker shunted by a resistance, with a view to avoiding the effects of the momentary short before the breaker opens, and has since relied on a large resistance only, carrying 50 amperes with 230 volts across it.

In the case of the three-phase H.T. supply being introduced at Ipswich, the author has come to the conclusion not to earth the centre point, on the score of greater reliability with pressures up to 6,600 volts. He has found in the case of several 6,000-volt systems that the omission of earth has been advantageous.

The supply network probably offers more chances of interruption and trouble to the engineer than any other part of his multifarious plant, and discussing this question, Mr. Ayton says that on direct-current systems some engineers prefer to connect up solid without the intervention of any safety devices such as automatic circuit-breakers or fuses, right away from the switchboard bus-bars to the consumers' cut-outs. Of course, fuses on the mains to isolate one feeder district from another are required by the Board of Trade Regulations. On the other hand, there are some engineers who prefer to protect each feeder at the switchboard by either a fuse or an automatic circuit-breaker. Others go further and insert fuses in the connections to the distributors themselves, in the feeder boxes or pillars. The author thinks there are some who go further still and fuse each individual distributor at every point where it connects to adjacent distributors. In connection with his own undertaking, he has no protective devices between the bus-bars and the consumers' cut-outs, but his experience has led him to think that such an arrangement, from the point of view of maintaining continuity of supply, is not an altogether desirable one, especially in connection with a three-wire system. Anything in the nature of a dead short on the mains, as a rule, means a complete shut-down. In his opinion, feeders should be arranged, by means of time limit maximum circuit-breakers or fuses, to free themselves from the bus-bars in case of any serious fault.

On the question of pillars or underground disconnecting boxes, the author is not alone in preferring the former; he draws attention to the old, old defect, apparently not yet appreciated by some firms, of providing ventilating holes or keyholes in such positions as to enable a mischievous person to insert a wire and touch a live part. The practice of fixing a pair of high-rated fuses inside the service box for small street lamp connections, which are liable to damage, is commended, as with the usual arrangement of fuses in the lamp switch there is a risk of shorting or earthing the service conductors if the switch is removed, the alternative being to make the main dead for awhile. On only three occasions have the 25-ampere fuses in the service boxes blown.

The author also touches on the matter of inspection and testing, and his remarks are sufficient evidence that even in these days of cut-and-dried practice, the latter can with advantage receive an occasional airing.

MR. W. W. LACKIE (Glasgow), following Mr. Ayton's remarks, said the first thing necessary to continuity of supply was a good coal heap. He outlined the features of a modern generating plant, pointing out the need for duplicating feed pumps, and the superfluity of providing ring steam mains. At Glasgow each alternator had its own exciter, and there was a stand-by motor-generator. While general duplication of feeders was unnecessary, network sections fed by isolated feeders could be fused to adjoining sections. In his own case two fuses in series were employed on some feeders, the smaller of the two for light loads being short-circuited during normal working. It was essential to have duplicate feeders between generating and sub-stations, and theatres were given two independent services, but one or two of them had installed a small battery sufficient for two hours' lighting in case of emergency, and this arrangement was preferable to a single large battery at the power station.

MR. ALEX. CRAMB (Croydon) drew attention to the importance of the employé—the majority of small failures being due to carelessness and neglect on the part of the employé. Unfortunately, it was difficult under municipal rule for engineers to enforce the strict discipline and care which was necessary to avoid such occurrences. The supply company's engineer was in a much superior position in this respect.

MR. H. H. COUZENS (Hampstead) mentioned that the auxiliary works supply at West Ham had been a difficulty, but a battery was being introduced which would automatically pick up the load if the main supply were shut down. As regarded the boiler question, in his experience it was more economical to run a number of boilers lightly, and thus have a large reserve of steam at hand almost immediately; the boiler efficiency did not suffer much down to about half-load.

MR. H. RICHARDSON (Dundee) strongly recommended the fusing of all feeders, according to the number of consumers and the load. Fusing required discrimination and observation of the conductors at the fusing points. After some experience of shut-downs due to breakage of switch pillars, he was going in entirely for underground boxes, but he admitted that conditions varied in different towns.

MR. H. R. BURNETT (Barrow) thought most engineers were agreed that feeders should be taken to pillars and then fused—underground boxes had been discarded by most people. He suggested that a demand indicator should be placed in the pillar for a week or so in order to indicate the load conditions for the fuses.

MR. J. CHRISTIE (Brighton) condemned the practice of using very small exciters to large alternators. At Brighton the exciters were very much underloaded, and the commutators and machines gave no trouble; he also disagreed with the use of excitation pressures of 50 or 60 volts, feeling that under present-day conditions there was no reason why from 200 to 250 volts should not be used. The ship telegraph was, in his opinion, much preferable to electric signalling in the central station.

MR. J. K. BRYDGES (Eastbourne) voiced his preference for the switch pillar as against the underground box. He believed in fusing, and thought it was almost compulsory now; it was necessary and advantageous, from the pressure point of view, to link adjoining networks by small fuses, which would blow and isolate faulty sections in emergencies.

MR. C. FURNESS (Blackpool) thought that discussion might more profitably centre on the question of fuel supply and the boiler house in view of the recent coal strike. In his opinion, the steam side was the most liable to failure.

MR. CARR (Leek) emphasised the value of the Diesel engine during the strike, pointing out the facility of oil storage.

MR. S. J. WATSON (Bury) was surprised to find any advocate of underground street boxes, which, in frosty weather, sometimes required two hours' thawing in order to get the lids off.

ALD. SMITH (Liverpool) felt that it was futile to keep coal bunkers full, if stokers were liable to go on strike at any minute, as had been the experience in his city. He felt that in such cases there should be no reinstatement of strikers, except under special circumstances.

ALD. BRUCE (Sunderland) and ALD. CROWTHER (Sheffield) and other Council representatives also referred to the coal strike, and MR. AYTON briefly replied to certain points raised.

(To be continued.)

Tramways Exhibition.—According to a report in the *Light Railway and Tramway Journal* it is proposed to hold an exhibition of tramway appliances in the depôt paint shop of the West Ham Corporation tramways, on the occasion of the Municipal Tramways Association's annual conference at West Ham next September. A definite period will be fixed on the afternoons of September 25th and 26th for inspection of the exhibits by the delegates. A meeting of firms interested was recently held. Mr. W. Hopkins, of the West Ham tramways department, is hon. secretary and treasurer of a committee that has been appointed to carry out the arrangements. Mr. H. E. Blain, the president of the Association, will act as chairman of the committee.

ELECTRICAL PROGRESS IN AUSTRALIA.

[FROM A SPECIAL CORRESPONDENT.]

MELBOURNE, *May 8th.*

MR. O. W. BRAIN, President of the Electrical Association of New South Wales, in his address to the members of the Association on Friday evening, May 3rd, reviewed the progress made in electrical matters in Australia during the 21 years that the Association has been in existence. In 1891 all the electric lighting in Sydney consisted of private plants in two newspaper offices, five hotels, three arcades, and seven or eight small installations. Now the Sydney City Council supplies current to 14 municipalities, while a private company supplies five others. The total supply in New South Wales is equivalent to 764,000 60-watt lamps. The employés engaged in the work of installing, operating, maintaining and repairing the electrical equipment of the State (not counting the telegraph and telephone staffs) has risen from 160 to about 8,000.

A comparison of the progress made in the various States of the Commonwealth during the period under review is—

	Electric supply in 60-w. lamps.		Total generating plant.	
	1891.	1912.	1891. KW.	1912. KW.
New South Wales ...	10,000	764,000	600	56,389
Victoria	31,000	616,300	1,680	20,660
South Australia ...	300	200,000	20	9,150
Queensland	6,000	114,600	450	8,212
Western Australia ...	100	210,000	3	16,000
Tasmania	30	84,000	3	6,500
Total	47,430	1,988,900	2,758	116,902

These figures are eloquent of the stagnation of Victoria and Queensland, and the progressiveness of New South Wales and Western Australia. The backwardness of Victoria, and the go-a-headness of her great rival, are evidenced, too, in the figures showing the electric traction of the States to-day. Twenty-one years ago there were in the whole of Australia only three cars in service, now the figures are :—

New South Wales	1,017
South Australia	180
Queensland	125
Victoria	120
Western Australia	105
Tasmania	45
Total	1,592

During the current financial year 130 new cars have been put into service on the New South Wales Government lines, 10 more than are in service in the whole of Victoria ; and the orders for the next financial year exceed this year's by 50 per cent. The electrical equipment, axles and tires are imported from England, but the complete cars, under-frames and trucks are constructed and equipped in the State. The Ultimo power plant has been increased to over 30,000 KW., and an order has been given for the first instalment of machinery for a new power house now being constructed at White Bay, with provision for ten 7,000-KW. units, capable of carrying a load of 100,000 H.P. Provision is being made at this new station for the use of more than 1,000 tons of coal daily, equal to almost the total daily consumption on the Victorian railways. The station is designed for construction and operation in complete separate units, so that pace may the more easily be kept with engineering progress.

Greenwich L.C.C. Power Plant.—In the report of the L.C.C. Highways Committee, it is stated that the cylinders of one of the reciprocating engines at the Greenwich generating station have recently become irregularly worn, and during the Whitsuntide recess they arranged with the makers, Messrs. John Musgrave and Sons, Ltd., for the cylinders to be rebored and new pistons and piston rings to be fitted at a cost of £147, the Council supplying certain unskilled labour, the cost of which will amount to a further £25. The company has in addition guaranteed a saving in steam economy of £1 per KW.-hour, which will amount to from £180 to £190 a year.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Electric Signs.

We have read with interest Mr. Cooper's article on "Electrica Signs as Advertising Media," and while wholly agreeing with him, would like to point out that the lack of animated and novelty signs in England is not due to any want of push by electrical sign builders. One of the most difficult problems is to convince an English advertiser that a sign can be built embodying practically any suggestion for a moving advertisement consistent with the specialities which he wishes to advertise. The writing type of sign and change-colour letter has now been on the market over ten years and save for an occasional one or two since put up here and there, the matter has been practically at a standstill from that time. The greatest difficulty to surmount is the objection which the London County Council have to any electric signs ; no signs are allowed to be fixed on the roof, and no signs are allowed to have any intermittent flashing arrangement on any licensed premises. The only chance there is to have anything of a moving description, is on premises which are not under the licence of the L.C.C.

Another drawback also is that should a scheme be submitted to the advertiser which meets with his approval, he will more often than not practically promise the order providing that the sign builder can find him a position in perhaps either Piccadilly Circus or Leicester Square or some other spot where it is almost impossible to get any more signs fixed, as, although there may be space enough for a small sign, there is nothing to be had for a sign of such size as would be required for a picture sign.

In order to overcome these difficulties, after much experimenting we have succeeded in bringing out animated signs illuminated with our well-known L.C.P. lamps and patent holders. These are considerably cheaper than signs with ordinary lamps, and they are being readily taken up by a number of well-known firms who advertise. We have at present in our shops several animated signs in the course of manufacture, one illustrating a firework display, another a cascade, and a repeat order of the clown sign that we recently fitted in the Strand.

Regarding the last paragraph of Mr. Cooper's article, we are constantly having visits from "enterprising foreigners" with ideas that will revolutionise the sign business of England, but as these gentlemen do not know quite what has to be contended with, we have no fear that there will be any "snapping up" of the English sign business.

The Franco-British Electrical Co., Ltd.,
A. H. BRACKENSIECK, *Secretary.*

London, W., *June 13th*, 1912.

An Objectionable Clause.

The amount of twaddle that has appeared under the heading of "An Objectionable Clause" is hardly understandable. It is either an attempt to bluff your readers into believing the Electrical Trades Union is a combination that is out to rob contractors, bring them to the Bankruptcy Court, do bad work, in fact, play the part of wreckers generally, or else to give our Society a cheap advertisement. The E.T.U. have a trade card for the London district, and the reading of the clause, to my mind, is that the contractor shall recognise the said card. Otherwise we might have a member of the E.C.A. employing men under the standard rate, and sending in their (the E.C.A.) card in excuse of non-compliance with a "Fair Wage Clause," with the usual "Didn't know," &c.

What a howl has gone up, because for once the Electrical Trades Union has got a fair show. The clause is objectionable, wicked, an attempt to rob the poor contractor, &c. Mr. Collins would not only like to have this said clause knocked out, but also all reference to Trade Unions, leaving it to the "fairness" of the contractors (and believe me I know some of their fairness) what rate should be paid. He

also would like the contractor to be the arbitrator, and not the Trade Unions. To an outsider it would very much suggest "Codlin's the friend, not Short."

My Society have to thank both "Fairplay" and Mr. Collins for suggested rules for our new London trade card which is in course of construction, also for their illuminating ideas of what the Electrical Trades Union really is.

W. J. Webb,
Electrical Trades Union.

London, S.W., *June 15th.*

The "National Code" in Canada.

I have read with some interest and no little amusement and considerable regret the effusions printed in your excellent journal on the "National Code." I regret that it seems quite impossible for Englishmen to become familiar with conditions before condemning everything in sight.

I am quite prepared to say, with all sincerity, that my experience has taught me that, in the long run or last analysis, the real Englishman is the very best bird of the kind. For real genuine worth, honesty and aggressiveness, he is, *par excellence*, "it." I am an English Canuck, so can afford to lay it on thick; nevertheless, we owe much to the "hearts of oak."

The newly arrived Englishman is aptly described by a reference to a scene I witnessed in the well-known comedy, "The Rich Mr. Hoggenheimer," where the newly arrived Englishman walks down the gangway, and before having seen anything of America whatever, places his monocle to his eye, and says, "Ah! this America, eh? Beastly place."

Now, the National Code is the consensus of opinion in America, and has grown from the natural soil, and brings forth the flowers that are best suited to the surroundings. True, the Code has not dwelt very much on the life hazard, but in the last edition there is little left undone in this respect. A real good job done under close inspection, and thoroughly in accordance with the Code, is nothing to be ashamed of.

As to the laboratories being pro-American; English, American, Canadian and German companies doing business in this part of the world all support these laboratories, and their geographical location on the map should not be used as an argument against them. Certain standards have developed as the result of years of experience, the particulars of which are printed to the minutest details.

All the American and Canadian manufacturers have worked out their products to comply with these rules, and the underwriters very fairly stand behind them, not entirely to benefit themselves, but as a protection to the trade also. The result is that perfect satisfaction exists between both parties.

Incidentally, the contractors know just what they can use and what they cannot. Now, the Englishman comes along with his stuff (material) and says, "We use this and that in England" by special appointment to King George, and that should be final, but the underwriters, very ungraciously, no doubt, think they know as much about wiring as "Royalty," and this is said with due deference to our beloved King.

If England wants the trade here, she must come here and make the goods here, and if prices are right then all will be well. One more point, and that is, that by far the larger percentage of fittings are made here, not 90 per cent. as stated being made in the States. Practically all the wire used here is made here, and what isn't made here is sold here by local supply houses doing business here.

The underwriters' laboratories are probably the finest, best equipped and most capably manned institutions of their kind in the world, and anyone submitting material there will get a square deal. They have the reputation of being absolutely fair from coast to coast, and I think rightly deserve it.

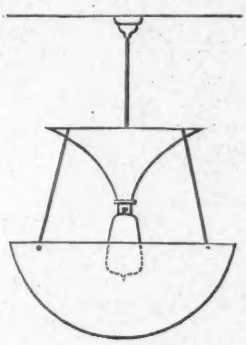
The Province of Ontario will probably have the latest regulations when completed, and if they in their wisdom see fit to establish purely Ontario laboratories, no doubt things will change, but so long as the Underwriters' are the only established and accepted rules, it is only fair when adopting them, to abide by them and treat all people alike.

Canuck.

Canada, *June 4th*, 1912.

Indirect Lighting.

Mr. Whistlefield's article on indirect lighting of rooms is not before its time. Last October I made an opal bowl by cutting round an arc lamp globe, and drilled three holes in the rim for suspension from a "Witelite" opal reflector. I wrote to several firms asking if they could supply opal bowls



about 9 in. diameter, and only one firm could take the matter up; they sent me a German catalogue illustrating such fittings.

I think the time has passed when the public appreciated a glaring lamp, and there is a future for some simple indirect lighting fittings; they will increase the lighting load.

The "Witelite" opal reflector I refer to has a neat curve, and is about 6 in. diameter, and is reversed when fixed on the holder.

I enclose a sketch of the fitting, and should be pleased to have the addresses of firms that could supply such opal bowls.

Resident Engineer.

Electricity Works, Stoke,
June 17th, 1912.

DOMESTIC LIGHTING AND HEATING.

By "AN OUTSIDER."

The public is not yet completely educated on questions of economy in its lighting bills; or, at least, its education is not yet up-to-date. The central station engineers cannot be held responsible, as they are so intelligently alive to their true interests as to try their best on all occasions to show how the customers' bills may be reduced. This is not due to altruism, but to the competition of gas, which promptly takes advantage of the least dissatisfaction on the part of the consumer to persuade him to go back to the rival illuminant.

The writer knows well a newly-built district where, as a general rule, gas piping and wiring are both installed, so that this competition has free play. If the electric lighting company only hears in time of any contemplated change from electricity to gas, it is speedily on the scene with practical and sound advice; but sometimes it loses a customer, and only hears of the fact too late.

The voltage is 240, and many of the residents have installed transformers to bring it down to 50, and are enjoying the full benefit of metallic-filament lamps. There are still, however, large numbers who use the full pressure, and carbon lamps; and these are occasionally the prey of the incandescent-gas man.

Apparently, they never think of applying to the electric light company for advice; but they become dissatisfied (naturally enough) with their quarterly bills, and change over to gas with but little persuasion.

The advantages of a gas cooker at a nominal rent, and a geyser for the bath water, generally weigh in pretty heavily.

The electric light engineers now spend their evenings after dark walking round the district and "spotting" the carbon-filament lamps in the homes, and then they give their advice unsolicited. Now they are pushing the new

high-voltage metallic-filament lamps, and pointing out that it is no longer necessary to transform down from 240 volts, but not everybody is aware of the fact; and, of those who are, some object to the higher price of the high-voltage lamps.

Among those who have transformers, it is safe to say that not one in ten knows that there are stand-by losses in connection with them. Naturally, they do not switch off at the main during the night, because the bedroom lights must be available; and they never think of switching off in the daytime either, because they do not know that the transformer is costing them something whether the lights are on or not.

In a recent case a heating circuit has been put in, at the high pressure, of course, and a transformer is being retained for the lighting circuit, or rather the downstairs portion of it. The question arose whether the transformer should be removed, and high-pressure lamps adopted all over.

The disadvantages of this course were, first, the necessity of scrapping the transformer, and a whole outfit of lamps, already installed; and, second, a little uncertainty in the mind of the customer as to the durability of the high-voltage metallic filament in small lamps.

In the end it was decided to put carbon-filament lamps in the bedrooms on the high-voltage circuit, as the usage of these lamps is so short each night that the loss as compared with metallic filaments will not be heavy; and the bedroom lamps are, under this arrangement, always ready for use.

The downstairs lamps are all metallic-filament 50-volt lamps, and are on the transformer, which is shut down at the main switch at all times, except the evening hours when the sitting-room lamps are required.

The heating circuit is available for cooking both in kitchen and dining room, and for heating in several other rooms upstairs and down, and the plug connections on the heating circuit are also available for driving an electric vacuum cleaner or similar plant. There is, of course, a separate meter and a lower price for the heating current.

In the house referred to, the great hot-water question still remains unsolved, and, for the present, the kitchen fire-back boiler must pursue its wicked career.

In spite of all the enterprise and energy of the electrical men, there is still some better organisation required for bringing them on to the scene in time, especially when a new house is being built.

Architects, as a rule, do not specify very closely the detailed requirements of the electric lighting outfit. As for the builder, he is generally in favour of the system which gives him the least trouble and expense in the first instance, thereby fulfilling the law of his being. And it is amazing to watch in a new house going up, how, owing to a lack of design and foresight in the first instance, so much of the work has to be done twice over.

The different trades seem to take a positive delight in destroying one another's work. The wireman takes his leads in the roof right across a trap-door, and has to be brought back to alter them. The plasterer cheerfully plasters down everything, including bell wires and electric conductors. The electric fittings man has to hack down most of the wall to find them again, and then the plasterer is again sent for to make good. Finally, the main connections are made by the company after the house is finished, for which purpose holes are broken through walls, tiled floors ripped up, and quite a lot of finished work destroyed.

In the end, the job gets "muddled through," and gives satisfaction; and such an installation is fairly proofed against the gas interest, except in the matter of the hot water, which is still a very weak point in the armour of the electrician.

Superheaters and Recorders.—Among the orders recently received by the SUN PATENT EVAPORATOR CO., LTD., of Liverpool, are the following: Sun patent superheaters for the Hoylake and Wallasey Electricity Departments; Sun patent turbo pumps for various firms, and Albion recorders for Bombay Electricity Department; Charing Cross Electricity Co.; Manhattan Corporation, N.Y.: South Metropolitan Electricity Department; Wandsworth Gas Co.; Midland power station, and many other works.

THE INTER-RELATION OF CAPACITY IN THREE-PHASE THREE-CORE CABLES.

BY W. T. MACCALL, M.Sc., A.M.I.E.E.

THE following points may prove useful in continuation of Mr. A. B. Clark's article published in the ELECTRICAL REVIEW of April 5th (p. 532):—

While it is possible to obtain the capacities between each core and the sheath (K_1), and between each pair of cores (K_2), from the results of any two capacity tests (with one exception mentioned below), difficulty in working out the values is avoided by choosing these tests from the following:—

No.	*Between*	*and*	*Capacity.*	
1.	One core	sheath and other two cores.	$K_1 + 2K_2$.	Fig. 2
2.	Three cores	sheath.	$3K_1$.	Fig. 3.
3.	One core	another core.	$\frac{1}{2}(K_1 + 3K_2)$.	Fig. 6.
4.	One core	the other two cores.	$\frac{2}{3}K_1 + 2K_2$.	Fig. 7.
5.	Two cores	third core and sheath.	$2K_1 + 2K_2$.	Fig. 9

The figures are from Mr. Clark's paper (reprinted for reference).

N.B.—In Test No. 3 it makes no difference whether the third core is connected to the sheath or not, since they are both at a potential midway between those of the cores under test.

The capacity measured in Test 3 is three-quarters of that in Test 4, hence only one of these may be included in the two chosen, if the determination of the separate values of

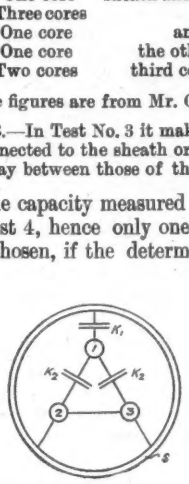


FIG. 2.

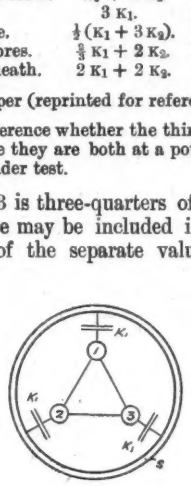


FIG. 3.

K_1 and K_2 is desired. This theoretical ratio is confirmed by Mr. Clark's measurements, which give ratios of ·75, ·73, ·75, and ·745 respectively.

For the purpose of obtaining the capacity current which a cable will take when in use, a single measurement of capacity is sufficient. For it can be shown that the capacity current for sinusoidal waves is given by the formula—

$$C = p\,(K_1 + 3K_2)\,E = p\,(K_1 + 3K_2)\,E^1/\sqrt{3},$$

where C = capacity current per core (in microamperes if the capacities are in microfarads);

p = $2\pi \times$ frequency;

E^1 = line voltage;

E = voltage to star point.

Now, $K_1 + 3K_2$ is twice the capacity obtained by Method 3, and $1\frac{1}{2}$ times that obtained by Method 4. Hence a single measurement by either of these methods is sufficient for calculating the capacity current.

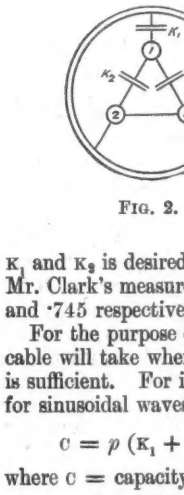


FIG. 6.

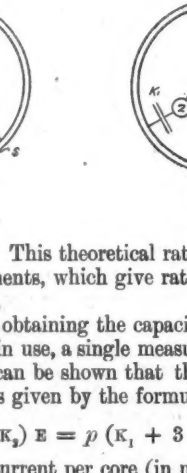


FIG. 7.

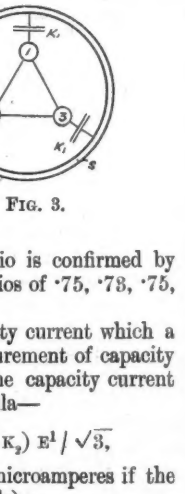
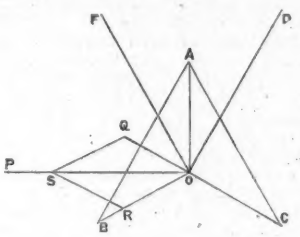


FIG. 9.

Thus it appears to be advisable to employ one of these methods in all cases; and to use one of the other three tests tabulated (preferably No. 2), when it is desirable to determine K_1 and K_2 separately, *e.g.*, for voltage waves differing considerably from the sine form.

The proof of the above formula is as follows:—Let O A, O B, O C in the accompanying vector diagram represent the (equal) voltages of the three cores above the sheath (star point). Then the current in line No. 1, due to the capacity

K_1 between it and the sheath, is $p K_1 E$, and leads O A by a right angle, as shown by O P.



The voltage of Core 1 above Core 2 is represented by $\overline{BA}$, or by O D parallel to B A, and its magnitude is $\sqrt{3} E$. Hence the current due to the capacity K_2 between Cores 1 and 2 is $\sqrt{3} p K_2 E$, leading O D by a right angle as represented by O Q; thus Q lies in C O produced.

Similarly, the voltage of Core 1 above Core 3 is represented by C A or O F, and the corresponding capacity current is again of magnitude $\sqrt{3} p K_2 E$. It leads O F by a right angle, and is represented by O R; thus R lies in O B. Since O Q and O R are equal and inclined at 60°, the vector sum (O S) of O Q and O R is $\sqrt{3}$ O Q $= 3 p K_2 E$, and bisects the angle Q O R, and thus is in phase with O P. Hence the total capacity current per line, which is the vector sum of O P, O Q and O R, is $OP + OS = p K_1 E + 3 p K_2 E = p (K_1 + 3 K_2) E^1/\sqrt{3}$, as stated above.

PARLIAMENTARY.

L.C.C. Tramways.

A SELECT COMMITTEE of the House of Commons, presided over by Sir Luke White, commenced the consideration of the L.C.C. Tramways and Improvements Bill before the Whitsuntide recess, and concluded its deliberations on June 11th. The Bill as originally framed proposed the construction of new tramways as follows:—(1) Double line between the existing tramways in Wood Lane and Harrow Road, *via* a new street, Walmer Road, Silchester Road, Clarendon Road, Cornwall Road, Westbourne Park Road and Porchester Road; (2) Double line between the existing tramways in Hampstead Road and Euston Road, *via* Euston Road; (3) Double line between the existing tramways in Essex Road and Kingland Road, *via* Englefield Road and Stamford Road; (4) Double line extension of existing tramways in Farringdon Road, along Farringdon Road and Farringdon Street; (5) Double line between the existing tramways in High Street, Shoreditch, and in Bishopsgate, *via* Norton Folgate and Bishopsgate; (6) Partly double and partly single line extension of the existing tramways in Tooley Street; (7) Double line between the existing tramways at Rushey Green and in Bromley Road; (8) Additional single line of tramways in South Lambeth Road. Proposals (2, 3 and 4) failed on Standing Orders, and the Council, in view of local opposition, themselves dropped the proposals in (1).

There was a good deal of opposition to the proposed extension in Tooley Street from owners and occupiers of warehouses, but the Committee decided to pass the proposal after visiting the spot in order to acquaint themselves with the neighbourhood and the conditions of the traffic. The tramways will thus be brought to a point some 300 yards nearer to London Bridge than the present terminus in Tooley Street, and the estimated cost of the extension is £6,900.

The Bill also contained a clause giving the Council power to run trailer cars on any of their tramways. Mr. Pollock, K.C., for the Council, stated that these trailer cars were needed to cope with the morning and evening rush traffic. He explained that the Board of Trade sanctioned the use of coupled cars in 1905 for the purpose of carrying stores in the morning and evening—following on experiments. Further experiments were made last year, but in August the Commissioner of Police, without whose licence those cars could not be run, refused to allow them to continue, on the ground that there was no convenience which would compensate for the obstruction and danger of accident.

MAJOR PRINGLE, giving evidence on behalf of the Board of Trade, said that the Department objected to the proposed clause, in that it contained no limit as to the number of trailer cars which could be run. They were strongly opposed to running more than one trailer, and only the leading car ought to have motive power on it. The hours of use, too, should be limited; the type of car should be determined upon, and the routes should be subject to the approval of the Board of Trade. He also thought that the Department should be given power to deal with the question of brake power and speed.

After hearing further evidence for and against the proposal, the CHAIRMAN announced that the Committee were unanimously of opinion that the preamble of the Bill had been proved, subject to the following conditions—that trailer-cars and coupled-cars should be fitted with brakes approved by the Board of Trade; that no trailer or coupled carriage should be used by the Council unless it had been approved by the Department; that there be no more than two cars linked together except by consent of the Board of Trade, and that the motor should be attached to the leading car only.

Kidderminster Local Government Board Order.—The Local Government Board Order relating to the extension of the borough boundaries of Kidderminster, which has been submitted to the House, contains the following provisions:—"So much of the area of supply under the Stourport and Kidderminster Electric Lighting Order, 1906, as is added to the existing borough under this order shall be added to the area of supply under the Kidderminster Electric Lighting Order, 1891, and the provisions of the last-mentioned order, and of the indenture of the transfer, dated May 5th, 1899, and made between the Corporation and the Kidderminster and District Electric Light and Traction Co., Ltd., shall apply thereto in lieu of the provisions of the Stourport and Kidderminster Electric Light Order, 1906."

Newton-in-Makerfield Urban District Council Electrical Supply.—Viscount Wolmer asked the Parliamentary Secretary to the Board of Trade whether the application of the Newton-in-Makerfield U.D.C. for a provisional order to authorise them to generate and supply electricity, had been refused on the ground that there was an insufficient local demand for electricity; if so, whether he could state how great a demand would have to be guaranteed by local consumers, and for how long, to enable the Board of Trade to reconsider their decision; and whether any other conditions would have to be fulfilled before that decision was reconsidered, and if so, what conditions. Mr. Robertson said that the answer to the first question was in the affirmative. The report of the consulting engineer of the Council showed that the success depended on certain large commercial firms taking a supply of electricity for power purposes, there being, in his opinion, no probability of any considerable demand for lighting purposes, and the Council were unable to satisfy the Board that they would be able to supply at a price which would secure these firms as consumers without imposing a burden on the rates. It was not possible for him to state definitely what demand would be sufficient to justify the Board in granting an order, and, in any case, he could not hold out any hopes of an order being granted this session.

Board of Trade Electricity Orders.—Viscount Wolmer asked the Under Secretary to the Board of Trade, whether he would publish a return of the orders granted by the Board of Trade during the last three years to local authorities to enable them to supply electricity in their localities, showing in each instance the population, the rateable value, the amount of local rates and indebtedness, and the nature and number of any guarantees forthcoming that the estimated demands for units of electricity by consumers would be taken by such consumers over certain periods of years, and other considerations that led the Board of Trade to sanction such orders. —Mr. Robertson said, in reply, that he did not think it possible to tabulate in a return the guarantees or considerations which had led the Board of Trade to make provisional orders authorising local authorities to supply electricity. A return could be prepared showing the population, rateable value, local rates and indebtedness in each case, but he doubted if it would be of sufficient interest to justify the expense.

Second and Third Readings.—In the House of Commons on June 13th the National Electric Construction Co.'s Bill was read a second time.

In the House of Lords on June 12th, the Loch Ericht Water and Electric Power Bill was read a second time.

The Ramsbottom Urban District Railless Traction Bill was read a third time.

BUSINESS NOTES.

Consular Notes.—Italy.—The British Vice-Consul at Messina reports that the steam tramway services between Messina and Barcelona northwards, and between Messina and Giampilieri southwards, were resumed during last summer, and had contributed in no small measure to the general well-being of the community. On both these lines steam will be replaced by electric traction shortly, and the existing services will be quadrupled.

The British Consul at Genoa reports that the Riviera Electric Supply Co. at Bordighera (a British concern) is steadily increasing its supply of electric energy, especially with regard to the application of electric power for irrigating the flower gardens. This company has extended its distribution of electric power to the neighbouring small towns of Camporosso and San Biagio, and another important extension is nearly completed from Ventimiglia, Latte, La Mortola, Grimaldi, and Balzi Rossi. The Société Elettrica Riviera di Ponente, with a paid-up capital of 10,000,000 lire (£400,000) has two hydro-electric power stations up the Roja Valley, above Ventimiglia; these stations produce respectively 10,000 and 6,500 H.P. Besides these the company is building a more powerful station higher up the same valley at San Dalmazzo, which will produce 50,000 H.P. The electric energy is distributed over the provinces of Porto Maurizio and Genoa.

The British Vice-Consul at Savona reports that a company has

been formed for the construction and working of an electric tramway line from Savona to Vado. This line is nearly completed, and will be ready for use early in 1912. The fare is 5 centimes per kilometre with a maximum of 30 centimes for the whole distance, which is about 7 kiloms. A new service of motor-omnibuses has been opened between Savona and Altare. With this exception, communication with the neighbouring towns and villages is still carried on by omnibuses drawn by two or three horses, but it is anticipated that most of these will shortly be superseded by motor-omnibuses.

The British Vice-Consul at Spezia reports that, after shipbuilding, the next most prosperous trade in the district in 1911 was the building trade. During the year several large blocks of flats sprang up. Many of these flats contain bathrooms, and nearly all are provided with the necessary fittings for illumination by electricity. Electric light was also installed in many of the older apartment houses, which have now become more desirable as places of residence. The telephone company, too, has extended its circle of subscribers, the number of whom, at the end of the year 1911, had reached 380. From the central office in Spezia, communication can be made with Genoa, Rome and other of the larger Italian towns.

The Austrian Consul at Milan, in a recent report, gives the following figures as showing the spread of the utilisation of electrical energy from 1895 to 1910, the figures being given in horse-power :—

	Hydro-electric.	*Steam.*	*Total.*
1895 ...	25,000	—	—
1900 ...	82,000	—	—
1902 ...	92,000	65,000	157,000
1904 ...	139,000	100,000	239,000
1905 ...	190,000	125,000	315,000
1906 ...	245,000	155,000	400,000
1907 ...	383,000	195,000	578,000
1908 ...	409,000	225,000	634,000
1909 ...	510,000	240,000	750,000
1910 ...	725,000	275,000	1,000,000

Lighting by electricity is rapidly spreading throughout Italy, and is more and more superseding all other kinds of lighting on account of the constant increase of power plants using water-power and the use of metallic filament lamps. About 12,000,000 electric incandescent lamps are used annually in Italy, of which the greater proportion is still imported from abroad, and notably from Germany, Austria, Switzerland, Holland, France, &c., although there are now works in Italy exclusively engaged in the production of these lamps. The better class glassware for electric lighting is imported chiefly from Austria and the cheaper varieties also from Germany. The greater part of the demand for brass and bronze fittings is covered by a considerable home industry, and only a few specialities and novelties are imported from abroad.

Venezuela.—The British Consul at Cuidad Bolivar reports that during 1911 an electrical plant was provided by a local company, and since the end of July of that year the town has been lighted by electricity.

Servia.—The Austrian Consul at Belgrade reports that the imports of steam engines, motors, and similar machines for power purposes in 1910, amounted to 1,063,143 kilogs, valued at 1,103,575 dinars, of which 356,125 dinars were from Germany, 331,630 dinars from Austria, and 385,150 dinars from the United Kingdom (a large increase). The use of motors is rapidly spreading and competition is keen. The imports of dynamos and electric motors amounted in value to 162,993, a decrease as compared with the previous year ; France supplied 122,553 dinars and Germany 37,365 dinars. The imports of transformers, accumulators, condensers, and electrodes are not important, and amounted in value to 51,854 dinars in 1910, almost equally from Germany and Austria. The imports of electrical cables and wire were valued at 74,237 dinars of which Germany supplied about two-thirds, and Austria about one-third. Telegraph and telephone apparatus, meters, rheostats, microphones, &c., accounted for 115,390 dinars, chiefly from Germany, France, and Belgium ; there was a large decrease as compared with the previous year owing to the fact that in that year large orders were completed for the Belgrade municipal telephone system. Arc lamps accounted for 5,502 dinars, and incandescent lamps for 189,719 dinars ; imports are chiefly from Germany in arc lamps, and from Austria and Germany in incandescent lamps.

Poland.—The Austrian Consul at Warsaw points out in a recent report that Austrian firms take a very important share in the trade in steam engines and turbines in his district. The demand at present is limited owing to the fact that new works are slow in appearing, but a large development of the trade is to be expected in the near future, and the Consul advises Austrian firms to keep a close watch on the market in order to take advantage of any opportunities which may present themselves.

Later in his report the Consul points out that Warsaw is the seat of a fairly large lamp industry, four big works with Austrian capital being engaged. The production in 1910 was valued at about 2½ million roubles, of which three-quarters was sold in Russia. The goods produced are ordinary cooking lamps, all kinds of cast-iron hanging and table lamps, brass lamps, fine bronze work for gas and electric lighting. Many articles, such as brass hanging lamps which, five years ago, were being imported largely from Germany, are now being produced in Poland in good qualities. Nevertheless, there is still a large importation of lighting materials for gas and electricity, of which Germany supplies about 90 per cent.

South Africa.—The Austrian Consul at Johannesburg in a recent report refers to the fact that with the erection of the Victoria Falls and Transvaal Power Co.'s works and the Rand Mines Power Supply Co.'s works at Brakpan, Simmer Pan and Rosherville, the electrification of the Witwatersrand has begun. Within a short space of time the use of electricity in the gold mines will be general. The above works are designed to produce 125,000 H.P. The demand for machinery and cables for these works has been extremely large, and has strongly influenced the total imports. As German capital was largely invested in the Victoria Falls Power Co., the demand for machinery, &c., has been to a great extent supplied by German houses, and the figures for 1910 showed that out of the total imports of electrical machinery valued at £803,168, Germany was credited with £479,617. The demand for electrical material, cooking apparatus, lamps, &c., in Johannesburg and district has grown tremendously, and will still extend if current for household use is cheapened, as will probably be the case. In no other district is the taste more up-to-date. Not only are the most modern cooking utensils required, but art lamps of all kinds are in strong demand, particularly taking into consideration the relative smallness of the population. The imports of electric lamps, and particularly metal-filament lamps are also growing rapidly, and Austrian firms are advised that they will find in South Africa excellent opportunities for their goods. The Consul also states that if Austrian firms would produce a lamp under a branded name, and advertise it well, they would be amply repaid in the South African market. In the trade in machinery and similar goods, a technical representative on the spot is absolutely essential.

France.—The British Vice-Consul at Caen reports that the electric lighting which has been installed along the canal there is a great improvement, and is much appreciated. The light is provided by a Westinghouse apparatus ; but though the lights are sufficient from Caen to Culix and Bensuville, beyond these places they are insufficient. On dark nights some sharp bends of the canal make navigation difficult.

The British Consul at Rouen reports that firms wishing to do business with France should express themselves in a clear and detailed manner, which, should they employ an agent, would enable the latter to answer at once all questions which a client is likely to ask from the supplier. It is necessary that all answers to inquiries should specify :—

1. The price per article, per dozen or gross, or per lb., cwt., &c., for goods taken at the works.
2. The cost of packing, and the cost of transport, separately, from the works to the British port.
3. The commission, the discount, and the terms of payment.
4. For all industrial supplies the necessary dimensions, and for machinery the space occupied, the diameter, and the width of the driving pulleys, the practical speed, approximate production, and H.P. required.
5. The gross and net weights are indispensable for the calculation of the transport weights and Customs duty. In the case of crates, cases, &c., weighing over one ton, the weight of the heaviest parcel is necessary.
6. The shortest date of delivery which can be promised *without fail* should be indicated.
7. When possible, all offers should be accompanied by samples, as many articles are only accepted on presentation of the same.

Catalogues or price lists, preferably in French, should be sent ; circulars about 8¼ in. by 10½ in., are the most practical, and the most appreciated.

Greece.—The British Consul at the Piræus reports that the publication in the Government *Gazette* of invitations for tenders for supplies to the Greek Government is made at such short notice that, in the majority of cases, there is no time for British manufacturers (not already represented on the spot) to compete. It frequently occurs that not more than a week elapses between the appearance of the Government *Gazette* and the date of the submission of tenders. This is especially so with reference to yearly supplies for the various services. Certain agents are aware of the approximate dates when supplies will be required, and they take steps accordingly, but so far as general competitors are concerned, the Government *Gazette*, as a source of information, is valueless. In the case of contracts for public works more time is given, but the original specification is frequently incomplete or faulty, so that further details must be obtained before a definite offer can be made. In some instances supplementary specifications are issued, but, in general, application must be made to the department concerned.

Mexico.—The British Vice-Consul at Tuxpan reports that in general the United States controls the commercial situation there both as regards imports and exports. This is owing to the proximity of the American markets and also to the energy of the American traveller. American goods of all kinds, as a general rule, are made to sell on their appearance, although, on the average, they are inferior to goods of British manufacture, to say nothing of the inferiority in packing. Owing to carelessness in packing and despatching cases from America, cases are often broken or damaged and the contents partly missing, either having been stolen or merely having fallen out and been lost. The contrary is the case with British goods, which show a marked superiority. Nevertheless, American firms continue to get business, and from inquiries made by the Consul in the United Kingdom, it appears that the reason is that British firms are unwilling to give credit, claiming that profits are too small to allow of it. For certain parts of Mexico, however, where so much delay is experienced in the arrival of merchandise, it is necessary to give three months' credit.

Hungary.—The British Consul-General in Buda-Pest reports that although there are many first-rate business houses in Hungary, care should be taken to ascertain the reputation of firms. It is difficult to do business promptly ; patience is required, and representatives of British firms might with advantage remain at Buda-Pest longer and study the commercial habits of the Hungarians with greater care. Credit inquiry agents at Buda-Pest are not always reliable. The

Consul is convinced that with more energy on the part of British traders larger business might be done. The prices of many British articles—making every allowance for duty, transport, risk, &c.—are so high at Buda-Pest, that it is thought that a general store, supplied with only good-class reasonably cheap British goods, might have a marked success. The Hungarian, as a rule, does not seem to understand that to sell a 100 articles with a small profit may pay better than to make a high profit on 10. In general, genuine British goods are at present only retailed by the larger firms, which charge partly according to their position and reputation. Great numbers of sham British goods are sold in the smaller shops at prices which should command fair qualities of the genuine article. The Consul suggests for the consideration of British firms interested, that their circulars, price lists, &c., should be translated either into Hungarian preferably, or German, giving equivalents of English weights, measures, and prices in the metric system. Cash payments on delivery in wholesale business are not usual in Hungary; British merchants should, therefore, be prepared to give credit, the length of which varies in the different trades. The British Vice-Consul at Koloszvar, himself a Hungarian merchant, reports that the soundest method of conducting business with Hungary would be to include freight and duty in prices, as is already done by some Continental firms. It should be borne in mind that the success that has been attained by some Continental commercial travellers in Hungary is said to be due in part to their greater efficiency, as well as to the long credit allowed by the firms which they represent.

Bolivia.—The British Vice-Consul at La Paz, reports that goods which have to be forwarded to the interior of Bolivia require to be especially strongly packed, as they will be carried on muleback, and will receive extremely rough handling. Cases should be marked *via* either Mollendo or Antofagasta, and, in addition, should bear the words, "En Transito para Bolivia," as well as the actual address in clear lettering. The usual credits given are three and six months. Several complaints have reached the British Legation at La Paz during the past year as to people to whom undue credit has been given by British firms, and who have not met the drafts when presented. The only advice which can be proffered to meet such cases is that British firms should not do business with unknown persons without first making due inquiry. In all cases it is best to do business only with the larger importing houses. During the past year several of the larger British firms doing business on the West Coast of America have opened offices in La Paz or Oruro, and a merchant who is opening up trade with Bolivia as a new departure might do well to correspond with them or their agents in the United Kingdom, before seeking to do business elsewhere.

The British Vice-Consul at Sucre also reports that some measure of credit must be given to traders in Bolivia if business is to be extended. German and French importers understand this, and avail themselves fully of the advantages of taking apparent risks. They also know that even some unpunctuality in the payment of bills is not always discreditable in some of their customers, as it is scarcely to be expected that people who are not habitually punctual in most things should always be so in this, as a matter of principle. The above remark does not imply that such unpunctuality should be extensively tolerated—a proceeding which would undoubtedly lead to much abuse—but that this circumstance, taken by itself, does not afford sufficient grounds to justify the total withdrawal of credit. The very nature of the country, with all its uncertainties in the matter of communications and transport, conduces to unpunctuality. As a case in point, bills at 90 days' sight sent for collection at the time of shipment of goods, with bill of lading and invoices attached, would be expected to fall due about the same time that the goods arrived, yet sometimes the goods only arrive several months after.

The Vice-Consul has been acquainted with the business of two banks for many years, and can testify that foreign bills of this class very rarely have to be protested for want of payment.

Rubber Manufacture for Electrical Purposes in Japan.—The *Board of Trade Journal* prints the following information from the report of H.M. Commercial Attaché at Yokohama (Mr. E. F. Crowe) on the trade of Japan in 1911, which will shortly be issued:—"In the electrical department of the rubber industry considerable progress has been made in Japan. The mills that exist have more capital than the majority of the mechanical rubber factories, the copper mine owners being connected with all the insulated wire mills, either as owners or as suppliers of the raw material. In the latter case they assist the mills by allowing credit on the sale of bare wire. The immediate future of the rubber industry is very much more promising in this branch of manufacture than in the mechanical branch. The one difficulty with which the mills have to contend is the lack of experienced technical men. They have up-to-date machinery, but the industry is so young in Japan that there are no native-trained rubber chemists. Several mills have experimented with foreign instructors, but the result has not been satisfactory in most cases, owing to the inability of the instructors to make themselves understood, and the inadequacy of interpreters for this purpose. The difficulty is one which will doubtless disappear as time enables the technical men to acquire their experience, but many costly mistakes have been made. The manufacture of insulated wire has already had its influence in checking the import of European rubber-covered wire, and, in addition to this manufacture, three of the largest mills have installed plants for making lead-covered telephone and high-tension cables. Although this is hardly directly connected with the rubber industry, the fact that mills have branched out in this direction merits attention, as having a bearing on the future importation of high-tension cables from abroad."

Manufacturing in France.—The report of the Ateliers de Constructions Electriques du Nord et de l'Est, of Jeumont, whose share capital was increased from £800,000 to £1,000,000 during 1911, states that the year was a period of great activity, and the works were extended by the addition of a steel foundry and wire-drawing and rolling mill. The value of the turnover increased from £484,000 in 1910 to £508,000 last year, whilst that in the new financial year would be considerably greater owing to the extensions of plant and the abundance of orders on the books for all departments. Among the latter were orders in connection with the conversion of the Paris suburban railways, the Western State Railway and various tramways; the Nantes Electricity Co. had ordered various turbo-alternators of large powers, and the single-phase locomotive of 1,500 H.P. submitted in the competition opened by the Southern Railway Co. had successfully undergone the severe trials to which it had been subjected. The Bordeaux Chamber of Commerce, which had previously obtained from the company four electric cranes with alternating-current motors, had ordered 16 further cranes. An enlargement of the pig-iron and bronze foundry had taken place, the steel foundry and its two open hearth furnaces were started early in 1912, and the electric furnace was on the point of being put into operation, whilst the wire-drawing mill, which was first set to work in April, was now at full output. The gross profits earned in 1911 amounted to £84,000, as compared with £77,000 in the previous year. After meeting general expenses and allocating £22,000 to depreciation, as against £20,000, the accounts show net profits of £59,900, as contrasted with £54,700 in 1910. It is proposed to pay a dividend of 12s. per share (6 per cent.), as compared with 11s. 3d. per share in the preceding year.

Electrical Trade in Finland.—The following information is from the report by H.M. Consul at Helsingfors (Mr. V. Kestell Cornish) on the trade of that district in 1911, which will shortly be issued: All goods connected with electrical machinery, &c., are supplied by Germany in far greater quantities than by the United Kingdom, with whom Sweden also competes in this trade. There does not appear at present to be any means by which the British import trade can be improved in such articles as telephones (received exclusively from Sweden), lamps, bells and other apparatus; but in electrical machinery, motors, &c., the United Kingdom might well compete, and is doing so to some extent, although the import is as yet insignificant. It should be noted in this connection that Finland is a country with great wealth in water-power, and that turbines and electrical machinery must needs be used in large quantities. It, therefore, appears extremely probable that the import of the latter goods will improve, as it is considered that the local factories will not be able to meet the demand. There should thus be an opening for a thorough study of the Finnish market in this trade, and for an attempt to supply, if possible, the particular article required. The British share of the imports of suction gas and other motors is important, and, it is considered, might be improved. It is difficult to say whether the import trade in this line developed in 1911, as no separate statistics are available, but it should be mentioned that motors of all kinds are largely employed in Helsingfors for boats and cars, and also in the building industry, &c.—*Board of Trade Journal.*

Catalogues and Lists.—THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Folder No. 229 entitled "Cooling Breezes," giving a few particulars with illustrations and prices of their electric fans, bracket and desk types (oscillating and non-oscillating), for the 1912 season.

THE "ALBION" RECORDERS CO., 427, Tower Buildings, Water Street, Liverpool.—Folder containing particulars and prices of the "Albion" CO_2 combustion meter and recorder, and showing some typical records.

THE BRITISH THOMSON-HOUSTON CO., LTD., 77, Upper Thames Street, London, E.C.—18-page list containing tabulated sizes, weights, and prices, &c., of an extensive range of wires, cables, and flexible cords for lighting and power work, &c., including rubber-insulated wires, lead-covered ditto, flexible wires, both single and twin, including various types of armoured flexibles, also flexible wires with earth return to comply with Home Office requirements. Motor-car flexible, bell wires, &c., are also priced. All B.T.-H. wires and cables are manufactured according to C.M.A. specification, and in both 2,500 and 600-megohm grades. A table gives particulars of copper conductors, and it is followed by another showing the maximum number of Mazda lamps of various sizes that can be connected to any particular size of cable, and also suitable casing or conduit for two conductors of any given size. The company holds large stocks of cables, &c., at Mazda House in London, and at its branches.

MESSRS. MATHER & PLATT, LTD., Park Works, Manchester.—Twelve-page pamphlet containing an illustrated description of their system of electric train lighting and its working, also showing the parts of the equipment, and giving dimensional drawings. The information is very detailed with explanatory line diagrams and half-tone views, and it should be of service to all interested in the subject of train lighting.

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., Tyssen Street, Dalston, London, N.E.—Price list D 4 (28 pages) second edition, dealing with all types of Holophane glassware now obtainable, together with the Holophane Benjamin steel reflector for "Wotan" and tantalum lamps. The Benjamin reflectors are designed to obtain an even diffusion of light on similar lines to that obtained by Holophane glassware, and they are made in the extensive, intensive, and focusing patterns in similar manner to the glassware. They are of special service in outside positions, workshops, large warehouses and stores where glassware is impossible on

account of its fragility. In this edition of the list there is also included their new type of household Holophane glass reflector, which we understand looks very effective on the ordinary type of electrolier which is largely used in private houses. Large stocks are held of the material shown in this list.

MESSRS. KRUPKA & JACOBY, 11, Queen Victoria Street, London, E.C.—Circulars giving prices of table, bracket, ceiling, and port-hole fans, also "Graetzin" metal-filament lamps.

MESSRS. ISARIA, LTD., 208, Tower Bridge Road, London, S.E.—Leaflets giving illustrations of, and brief information relating to, electric fans and instruments; also one giving prices of "Isaria" metallic-filament lamps.

THE ELECTRIC CONSTRUCTION CO., LTD., 9, New Broad Street, London, E.C.—Sheet No. B/285 giving an illustrated description of their E.C.C. oil-immersed starters for C.C. motors.

MR. G. BRAULIK, 8, Lambeth Hill, London, E.C.—Leaflet No. 30 describing and showing Hatry's patent indicating fuse bridge, which allows of a fuse being easily replaced in the dark. It is used at hotels and hospitals, and large stocks are held.

Dissolutions and Liquidations.—GLOBE ELECTRIC CO., LTD., 11, Farringdon Avenue, E.C.—In pursuance of Sec. 188 of the Companies' (Consolidation) Act, 1908, a meeting of the creditors in this matter was held at the Cannon Street Hotel on Tuesday last, when Mr. Ernest C. Pegler, F.C.A., liquidator of the company, presided. A statement of affairs as regards creditors, and disclosing the position as at June 3rd, 1912, was presented, showing liabilities to unsecured creditors £2,301, of which £1,418 was due to ordinary trade creditors and £884 to Mr. K. Weinert. There was stated to be a contingent creditor for a claim for damages for breach of contract, but the amount was put down on the statement as unascertained, and the liquidator stated that he would deal with the matter later in the meeting. The assets consisted of cash at bankers and in hand £493; bills receivable estimated to produce £239; stock estimated to produce £450; furniture, fixture, &c., £30; debtors (good), £1,316; doubtful and bad, £430 (estimated to produce £50), making total assets of £2,578. From this amount had to be deducted mortgage debentures for £2,000, and rent recoverable by distraint £57, making together £2,057, and thus leaving a surplus of assets subject to the costs of realisation available to meet claims of unsecured creditors of £520, or a deficiency as regards creditors of £1,781. The statement showed that first mortgage debentures had been issued amounting to £1,000, and second mortgage debentures to a similar amount. The chairman said that the company went into liquidation on June 3rd, and by the resolution passed he had been appointed liquidator of the company. The company had been formed in April, 1909, for the purpose of dealing in arc lamps, and in the autumn of 1910, or a little earlier than that, negotiations were entered into with a German firm, which resulted in a contract being signed in substitution of a previous agreement. That contract provided, or agreed for the supply, by Mr. Weinert of what were called Multax Century Lamps—*i.e.*, arc lamps designed to burn from 80 to 100 hours. That was a form of lamp which had not apparently been produced, and for which there was a very large demand in America. The Globe Co. had entered into a contract with Messrs. Fox Bros., a firm in America, to supply this lamp, and the contract was certainly one which was favourable to the Globe Co. if it could have been duly fulfilled, and would have undoubtedly resulted in considerable profits accruing to the company, and might, and probably would, have avoided the position that had now arisen. Unfortunately, however, Mr. Weinert found himself unable to fulfil his part of the agreement, and as a result the Globe Co. found themselves unable to deliver the lamps to Messrs. Fox Bros., although they made from time to time numerous endeavours to get Mr. Weinert to fulfil his contract; but all they received, apparently, were promises of deliveries. However that might be, the lamps could not be delivered, and ultimately Messrs. Fox Bros. put in a claim against the Globe Co. for £5,000 damages for breach of contact. The Globe Co. found themselves in a difficulty to meet this claim, and eventually it was decided to consult counsel and obtain advice. Counsel's opinion was therefore taken, and this was to the effect that the company should go into liquidation. This, said the chairman, was shortly the origin of the company going into liquidation; it was due to the failure on the company's part to fulfil their contract with the American firm, and to the failure on the part of Mr. Weinert to fulfil his contract with the Globe Co. Proceeding, the liquidator said that the American firm in question were substantial people, and good evidence had been given of this. There could be no doubt that a very large demand had existed in America for this lamp, and could it have been produced, as had been hoped and believed, the very large orders that would have resulted would have brought a large profit to this company. A creditor asked whether the liquidator was suing Mr. Weinert. The chairman replied that he had not commenced any action, and he did not want to take any actual steps until this meeting of creditors had been held. He had, however, informed Mr. Weinert that he was not delivering up to him the consignment stock which was estimated to produce £1,000, and which was held as security against the company's claim. He had also informed Mr. Weinert that the company would have a substantial claim to make. With regard to Mr. Weinert, he repudiated all liability under his contract, and he claimed about £1,500, which he contended the company owed to him, so that at the present moment they could not be said to be exactly in agreement. It would depend largely upon subsequent events as to what actually happened. Whether he remained as liquidator, however, or whether any other liquidator were appointed, it would be his duty to consider the position as regard Mr. Weinert very seriously.

Mr. Scholey asked why Mr. Weinert had not carried out his contract, and the chairman replied that the reason was because of technical difficulties, and, as he understood it, they could not get the combination of long-burning hours and satisfactory behaviour as well from the lamps.

Mr. Scholey asked whether the directors had not satisfied themselves as to that in the first instance, before entering into a contract. The chairman replied that he believed a sample lamp was sent over and was found to be satisfactory, but it could not be reproduced. Definite representations were made by Mr. Weinert that he could produce this lamp, and the sample had been tested up to a point in the presence of a representative of the American firm who also expressed himself satisfied, so that Messrs. Fox Bros. were in possession of full knowledge of the whole matter. Information was then sought by creditors as to who were the debenture-holders. The liquidator replied that the first debenture of £1,000 was issued on January 10th, 1912, to Mr. S. J. Atkinson, who was one of the directors, the consideration being for cash. The reason why this debenture was issued was because it was imperative that the company should have further capital, and the directors were still in hopes at the time that it would be possible to obtain from Mr. Weinert a lamp which would fulfil the conditions that were required, and under which circumstances they would have been able to enter into negotiations again with Messrs. Fox Bros. The only possible means of enabling the company to carry on for a certain time was that it should have further capital, and this debenture had been issued in pursuance of that. The second debentures were issued on the next day as to £500 to Mr. Atkinson and £500 to Mr. Schmahl. The £500 debenture to Mr. Atkinson was for cash advanced by him, and it was part of the arrangement under which the £1,000 was advanced to the company that Mr. Atkinson should receive a first mortgage for £1,000 and a second mortgage for the £500. In regard to Mr. Schmahl, £250 of this was in respect of cash and the remainder his remuneration as a director which had not been paid to him for some time. Mr. Scholey asked for information as to when the unsecured creditors' debts were incurred, and the chairman said that he was unable to give details of this. The last balance-sheet of the company, according to his recollection, showed the position as at March 31st, 1910, and he believed that it showed a small loss. With regard to the share capital, as to which another creditor asked for information, the total capital was about £2,102; £500 was issued as fully paid and the rest for cash. There was nothing owing in respect of share capital at present. Asked as to what the £500 represented, the chairman said £250 was for goodwill and £250 for stock.

A Creditor: Who was the vendor?—The Chairman: Mr. Santoni.

Later in the meeting a representative of the firm of Michael Abrahams & Sons, solicitors, stated that he represented Mr. Weinert, and as his client had been to some extent the scapegoat, he thought it was fair that he should put his client's position before the meeting. He said that he had seen the agreement between Mr. Weinert and the Globe Electric Co., and he was satisfied that there was no breach of the agreement whatever. His client's claim against the company was £1,488, and there was stock belonging to his client of the value of £1,900. The agreement between his client and the Globe Co. distinctly provided that no debentures should be issued to anybody without his client's consent. Yet, notwithstanding this, in January last debentures for £2,000 had been issued and taken up by the directors of the Globe Co., or, in other words, by the very persons who had entered into the agreement that they would not issue debentures without his client's consent. So far as any alleged breach of agreement was concerned, this was entirely contradicted by Mr. Weinert. He suggested in January last that the matter should go to arbitration, and those proceedings had gone on from January until April, when the Globe Co. wrote that Messrs. Fox Bros. refused to continue the arbitration, and that they therefore could not go on. The solicitor for the company here interposed, and said that the reason why the arbitration did not proceed was because Messrs. Fox Bros. refused to go on with it. This point had already been adjudicated on by the Court, and the Globe Co. took the defence that the matter was the subject matter of an arbitration, but the Court decided that the agreement was not a good agreement, and that the action must proceed. Later in the meeting the solicitor said that an action was pending against the Globe Co. by Messrs. Fox Bros., and, in his judgment, if any claim for damages against this company were allowed, the Globe Co. would have an absolute right to recover the same from Mr. Weinert. He would not, of course, discuss the merits of the action, but he had advised the liquidator that he should not part with any of the goods which he held as stock of Mr. Weinert, until the whole of the questions were disposed of. If it was ultimately decided that Mr. Weinert was a debtor to this company, then the liquidator would have the right to hold the stock for the benefit of the creditors.

A creditor asked the chairman whether he was the Receiver for the debenture-holders as well as liquidator of the company, and the chairman replied in the affirmative. Another creditor said that there were those present who would probably like to have some voice in the liquidation of the company, and it was undesirable that the Receiver should also be the liquidator. He would move that the meeting be adjourned for 14 days. This resolution was seconded, but the company's solicitor said he could not advise the chairman to accept that resolution, as there was nothing in the Companies' Act to show that the creditors could adjourn a meeting.

Mr. Scholey insisted that adjournments of such meetings were frequently arranged, and he contested the solicitor's right to say that no such adjournment could be decided on.

Mr. Luker then moved that the liquidation be left in the hands

of Mr. Pegler, and this resolution was duly seconded. It was later put to the meeting, but on a show of hands was clearly lost, and the chairman, with regard to the first resolution, namely, that of the adjournment of the meeting, said he was obliged to rule it out of order, although it had been carried. This brought the meeting to an end. The following are creditors :—

Armorduct Manufacturing Co.	£237	Conradty, ——	£53
Batt & Hart	83	"Electrical Review"	27
Beaudreaux	18	Ediswan United E.L. Co.	48
Electrical Co.	45	Electric Magneto Tool Co.	34
Greenwood & Co.	25	Falk, Stadelmann & Co.	10
North-Western Appliances	88	Plania Werke	77
Perry, F. A.	72	Regina Electric Co.	328
Quitman, Carl	41	Smith Premier Co.	20
Sloan Electric Co.	18	Adolf Schuch	46
Ships Carbons, Ltd.	853	Weinert, K.	883

In the Chancery Division on Tuesday, on the petition of SIEMENS BROS. DYNAMO WORKS, LTD., Mr. Justice Swinfen Eady made a compulsory order for the winding up of Taylor, Plinston Bros. and Co., Ltd.

SUNBEAM LAMP CO., LTD.—The adjourned meeting of creditors is to be held at Pilgrim House, Newcastle-upon-Tyne to-day, Friday, at 3.30 p.m. The committee appointed by the shareholders have informed the liquidator that they have come to the conclusion that it is not possible to devise any scheme of reconstruction which, under the circumstances, could be carried through.

LIGHT AND POWER FITTINGS CO., 25, City Arcades, Birmingham.—Messrs. T. Phillips and J. A. Charnock have dissolved partnership. Debts will be attended to by Mr. Charnock, who will continue the business at the same address.

STASSANO ELECTRO FLEX STEEL AND FURNACE CO., LTD.—A meeting is called for July 19th at 49, Leadenhall Street, E.C., to hear an account of the winding up from the liquidator, Mr. A. Hobbs.

ARC LAMPS, LTD.—A meeting is called for July 23rd at 3 and 5, Crown Court, Old Broad Street, E.C., to hear an account of the winding up from the liquidators, Messrs. H. B. Clark and G. E. Corfield.

Victoria Turbo Pumps.—Recent orders for "Victoria" turbo pumps booked by MESSRS. JENS ORTEN-BOVING & Co, include several important mining and waterworks installations, amongst which are included the following :—

Montreal Water and Power Co., repeat order, for two pumps, each to deliver 7,000 G.P.M. against a head of 455 ft. at 1,260 R.P.M., each pump being coupled to a 1,400-B.H.P. motor.

One pump for the Berrida Tinfields, Ltd., to deliver 1,900 G.P.M. against a head of 103 ft. at 600 R.P.M.

One pump for the Great Western Colliery, S. Wales, to deliver 417 G.P.M. against 750 ft. head at 1,450 R.P.M.

One pump for the Goss Moor Tin Alluvials Co., Ltd., to deliver 3,130 G.P.M. against 112 ft. head at 580 R.P.M.

Four 600 G.P.M. pumps for the City of Moose Jaw, Canada.

And others for the Tanaka Gold Mine, Japan; the Lothian Coal Co. (fourth repeat order), &c.

A Fireproof Osram.—We have before us as we write a print received from the GENERAL ELECTRIC CO., LTD. It is a reproduction from a photograph received by them from the General Electric Co. of China, Ltd., showing the utter indifference of an Osram lamp and fitting to fire, looting, and other experiences through which the native city of Tientsin recently passed. The looting was consequent upon an outbreak amongst the Republican troops, and the damage done was very serious. Among the premises burned was a goldsmith's shop—indeed, the whole of the street in which the premises were situated was burnt out—and after the fire the Osram lamp and fitting was the only article remaining intact within the whole area affected by the fire.

Private Meetings.—BALCHIN SCHULTZ & CO., LTD., Electrical Engineers, Gloucester Street, Theobalds Road, London, W.C.—The creditors interested in this matter were called together last week, when it was stated that the principal creditors had previously been consulted and they decided that a general meeting should be held. According to the figures presented the liabilities totalled £2,643. The assets totalled £3,720, and a considerable surplus, therefore, was disclosed. It was reported that the book debts had been written down by over £300, while a sum stated for the work in progress was the realisable amount and was not subject to any deductions. The stock had been valued at a low figure, while the plant and fixtures had been taken on the basis of a going concern. Even if sold at a break-up price they would realise from £350 to £400. It was further stated that the principal trade creditors were of the opinion that the position of the company was fairly disclosed. During the year ended June, 1910, there was a loss of £200 on the trading, while in the ensuing twelve months the loss was nearly doubled. Up to May of the present year a small net profit had been made. The turnover had been in excess of £3,000 per annum, upon which a gross profit of about £1,200 had been made. It was stated that the establishment expenses would be materially reduced and the company should then show a good net profit. With regard to a superheater patent, it was stated that its actual value ran into thousands of pounds. If the company had time in which to dispose of the patent it was expected that a large profit would be made. A proposal was made that the trade creditors should undertake not to press the company, and to accept payment in full by instalments. Should the patent be disposed of the creditors would be paid in full at once. The offer made was accepted, the debenture-holder undertaking not to appoint a Receiver without giving seven days' notice to a committee consisting of the representatives of Messrs. Baxter & Caunter, Ltd., Messrs. Pfeil & Co., and Messrs. J. & H. Grevener.

Angold Street Lighting.—THE GENERAL ELECTRIC CO., LTD., have received an order from the Dundee Corporation for 80 of their Angold magazine flame arc lamps for street lighting. This order was placed after the lamps had been subjected to severe tests extending over several months. The Sunderland Corporation has also placed an order for 28 Angold magazine flame arc lamps, this being the third repeat order received from it by the G.E.C. during the past nine months.

Installation Contracts.—MESSRS. W. G. HEATH & CO., of Plymouth, have the following electrical installation work in hand :—

Buckfastleigh.—New station equipment, complete, consisting of suction-gas engine and plant, with storage battery, switchboard and generators, for the Buckfastleigh Electric Supply Co.

Ivybridge.—New storage battery and control gear for the Ivybridge Electric Supply Co.

Ottery St. Mary.—Complete installation of power station, with generators, storage battery, switchboard and overhead wiring on steel pillars for public supply, lighting and installation of about 500 lights, for Messrs. Coleberg & Co.

Truro, Cornwall.—Complete mill installation for both lighting and pumping, consisting of generator, switchboard, storage battery and lighting for 50 lamps, for Messrs. Hosken, Trevithick, Polkinghorne & Co.

St. Austell, Cornwall.—Country house installation, complete with oil engine, generator, switchboard, battery, motor, pumping set and wiring complete at "Hembal," for Mr. B. C. Andrew, architect, St. Austell.

Penzance.—New Pavilion, lighting throughout for approximately 70—100 lights, for connection to supply company's mains.

Southampton.—Lighting throughout Shirely Warren Infirmary, for 300 lights, for the Guardians.

Book Notices.—"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVIII, No. 5. May, 1912. New York: The Society.

"Report of the Departmental Committee on the Science Museum and the Geological Museum." Part II. 1912. London: Wyman and Sons, Ltd. Price 6½d.

"*Proceedings* of the Association of Mining Electrical Engineers." Vol. II. 1910-1911. London: *Iron and Coal Trades Review*. Price 6s.

"Atti della Associazione Elettrotecnica Italiana." Vol. XVI, Nos. 4 and 5. April and May, 1912. Milan: Stucchi, Ceretti e C.

"Bulletin Scientifique de l'Association des Elèves des Ecoles Speciales." May, 1912. Liége: The Association. Price 75 cents.

"*Journal* of the American Society of Mechanical Engineers." June, 1912. New York: The Society. Price 35 cents.

"The *Engineer* Directory." 1912. London: *Engineer* Office. Gratis.

Metric System.—From April 1st the metric system has been made compulsory in Denmark, and English exporters to that country would do well to take note of the innovation.

Trade Announcements.—MESSRS. W. C. MARTIN AND CO., of Glasgow, announce that Mr. Gilbert Austin has been assumed as a partner, and the business of the firm will continue to be carried on as before, under the name of W. C. Martin & Co. Mr. Austin has occupied the position of manager for many years, and will continue to give his personal attention to the practical work of the business.

Mr. F. J. Borland announces that he has now transferred his business to the firm of BORLAND, HAGEDORN & CO., LTD., electrical engineers, Garrick Yard, 66A, St. Martin's Lane, London, W.C., who will carry on the manufacture of the Scissors arc lamp and other specialities with which his name has been associated for the last 17 years at his works in Leeds. The new firm will make a speciality of novelties in theatrical lighting, of which lists will be issued from time to time.

THE BENJAMIN ELECTRIC, LTD., of 117, Victoria Street, S.W., announce that some of their correspondence has been recently intercepted, and if letters have not received prompt attention, they will be glad to hear from the writers.

MR. F. L. WARREN, engineer and surveyor, has removed to 155 Fenchurch Street, London, E.C. Telephone No. "4972 Central."

Owing to a large increase of orders received during the last year, MR. GEO. ELLISON has had to take additional premises. He has secured a large works situated in Summer Hill Street (14 to 17), Birmingham, which will be devoted to the manufacture of parts of his well-known A.C. control gear, also to new lines such as D.C. and A.C. controllers, crane panels, limit switches, &c., which he has recently taken up. The acquisition of the new premises will enable the staff employed at Victoria Works, Warstone Lane, Birmingham, to be increased; all correspondence will continue to be dealt with at these works.

MESSRS. ISARIA, LTD., of 208, Tower Bridge Road, London, S.E., announce their formation as a limited company to devote special attention to the sale of electricity meters, motors, fans, measuring instruments, metal-filament lamps, and other products of the Isaria Zaehlerwerke, of Munich, for which they have the sole agency for the British and Colonial markets. A large stock will be held in London, and a meter-testing station and repair works are attached to the offices.

Premises in Market Street, Heckmondwike, have been opened by MESSRS. H. HAINSWORTH, LTD., electrical engineers.

Bankruptcy Proceedings.—CECIL WRAY, electrical and mechanical engineer, Bradford.—Application for debtor's discharge is to be heard on July 23rd at Bradford.

LIGHTING and POWER NOTES.

Australia.—At a meeting of the Williamstown (V.) Council, it was proposed that the Council should enter upon schemes for the electric lighting of the town and the provision of a railless trolley system between Williamstown and Melbourne. The matter was referred to a committee for full investigation and report.

Owing to the large present and prospective demand for the supply of electricity for both power and lighting purposes, the Melbourne Electric Supply Committee contemplates spending £140,000 during the next three years.

Barnes.—The double link from Lower Richmond Road is to be extended at an estimated cost of £120. The £1,000 standing to the credit of the electricity fund is to be put aside as reserve.

Bath.—The Street Lighting Committee has recommended that electric lighting replace the old gas lamps in several thoroughfares. This change is consequent on the extension of the boundaries.

For the new electric bakery for the Twerton Co-operative Society, which has just been opened, Messrs. Joseph Baker & Sons, Ltd., undertook the installation of the ovens and fittings, and Messrs. Melvin & Sons the machinery, of which about £1,000 worth has been installed. The electric current is supplied by the Bath Electric Light Works.

Batley.—Negotiations with the Yorkshire Electric Power Co. for a bulk supply have been re-opened. A few weeks ago the Electricity Committee rejected an offer of energy in bulk from the company, and decided to extend its works, generating plant and cables at an outlay of £16,000. This recommendation was arrived at after exhaustive inquiries and visits paid to many works, and it was proposed that a 750-KW. steam reciprocating set should be purchased, because sufficient work could not be found to run a 1,000-KW. turbine set profitably. It is understood that the Electricity Committee now proposes to withdraw its scheme altogether, and to buy energy from the power company if the latter will withdraw a condition which seeks to bind the Corporation not to install any plant for the generation of alternating current.

Bedford.—The T.C. has applied to the L.G.B. for loans of £500 for mains, £700 for services, £300 for meters, £600 for transformers, £1,000 for public lighting and £2,952 in respect of excess expenditure.

Brighton.—The Electricity Committee of the T.C. has again recommended the adoption of the assisted wiring scheme, by which it is proposed that all wiring contractors in the borough who will undertake wiring and fitting work are to be invited to accept 1d. per unit received by the Corporation over 4d. per unit for energy consumed by the occupiers of premises wired under the scheme.

Buluwayo.—At the annual meeting of the Buluwayo Waterworks Co., Ltd., held in London last week, the chairman, the Right Hon. A. R. M. Lockwood, C.V.O., M.P., said that £4,411 was spent on capital account upon the electricity supply extensions The gross profit on sales of electrical energy showed a very satisfactory increase. The profit was £6,841, as against £2,777 in 1910. The improvement in the department was referred to at the general meeting last year, and was the result partly of the general improvement in trade and partly of the various economies which have been effected by the manager, Mr. B. K. Ward. The number of consumers in December was 744, as compared with 649 in December, 1910, and the total number of units sold during the year was 121,614, as compared with 96,358 in 1910. The arrangement with the municipality for further payment in consequence of the additions to the street lighting came into force on December 1st, and they were now receiving £1,500 per annum from that source. The manager stated that the experiment of supplying electric power, which was started in August last, was expected to be a decided success, the result so far being an increase monthly from this source. The current was being most usefully employed at the present time for pumping the water from the boreholes.

Bury St. Edmunds.—The T.C. has decided to supply day-load current to Messrs. R. Boby, Ltd., at the following terms: 50,000 units, 1d. per unit; 75,000, $\frac{15}{16}$d.; 100,000 units, $\frac{3}{4}$d.

Cheam.—At the last meeting of the Parish Council offers received from the Electric Lighting Co. and the Gas Co. for lighting the district were considered. The former company offered to maintain 60 lamps of 100 C.P. at £3 3s. per lamp per annum, but for every new lamp erected, at £2 5s. per lamp; while the Gas Co.'s prices were £3 5s. for one part of the district, and £3 9s. 4d. for another part. After discussion, it was decided to ask the Electric Light Co. to supply a light outside Cheam House as a test.

Cheltenham.—The Cheltenham Gaslight and Coke Co. have given notice of opposition in the House of Commons to the Cheltenham Electric Lighting Extension P.O.

Clacton-on-Sea.—The U.D.C. has decided to extend the lighting mains to St. James's Estate, which is being rapidly developed, at a cost of £460.

Colchester.—The accounts of the Electricity Department show that the units sold increased last year from 1,488,458 to 1,497,425, an increase of 8,967 units, but the value decreased from £15,929 to £15,857, a reduction of £71. This was caused by the large decrease in units at 3½d., due mainly to the alterations in the Government installation. There was an increase of 15,269 units for lighting purposes at 4d., and an increase in power units (other than tramways) of 66,918. Tramway power units decreased 33,994. Miscellaneous income increased from £319 to £478, an advance of £159. The net increase in the total income was, therefore, £87, and the total income amounted to £16,335. The total expenditure amounted to £16,213, thus leaving a surplus of £122, compared with £212 a year ago. The year's working showed an appreciable decrease in the cost of coal per unit, but the cost of heavy repairs to boilers has more than swallowed up the saving effected.

Continental Notes.—FRANCE.—The municipal authorities of Beaumont-sur-Oise (Seine-et-Oise) have lately granted a concession for the electric lighting of the town.

A scheme is under consideration to put down a plant to utilise the water-power of the River Isère, at Chateau Neuf d'Isère (Department of Isère) in the generation of electrical energy for lighting and power purposes. It is estimated that about 2,000 H.P. is available.

ITALY.—A concession has lately been granted for the supply of electrical energy for lighting and power purposes in the town of Cosseline.

HUNGARY.—The municipal authorities of Izsak are at present considering a project to establish a central electric lighting station in the town.

AUSTRIA.—Herr Max Asiel, a mineowner, of Vienna, has made application for a concession to use three waterfalls on the Rivers Raab and Moder in connection with a project to build hydro-electric stations.

The firm of B. Fischer-Reinau, of Zurich, supported by a foreign capitalist group, has applied for sanction to a scheme to build a power station on the left bank of the Danube between Au and Hütting, of a total capacity of 150,000 H.P. It is intended to construct a canal 15 km. long and 150 m. broad. The cost of the scheme is placed at 100,000,000 kronen.—*Der Elektrotechniker.*

Dundee.—The electrical engineer of the Corporation has reported that it will be necessary to proceed immediately with extensions to the Carolina Port station, as these must be ready for operation in the winter of 1913. The Committee has agreed to go forward at once with an application for borrowing powers to the Secretary for Scotland. The amount required will be £68,000.

Ealing.—At the last meeting of the Council the following scale of charges for the supply of electricity to those using a supply which is neither purely for power nor for lighting was adopted:—Up to 200 units per quarter, 3½d. per unit; 200 to 400, 3d.; 400 to 600, 2½d.; 600 to 800, 2¼d.; 800 to 1,000, 2d.; 1,000 to 1,500, 1¾d.; 1,500 and all units over, 1½d.; the minimum charge to apply in all cases where the amount taken over the 12 months does not, together with meter rent, reach the sum of 26s. per annum.

Falkirk.—A special meeting of the Falkirk and Larbert Water Trust was held on Monday to consider the attitude of the Trust to the Falkirk and Linlithgow Electric Lighting Order. The Board of Trade recently announced that they did not think it necessary to include in the order the protective clauses asked by the Trust. It was decided to make a further petition, in order to have the clauses desired, which are the same as those contained in the Scottish Central Electric Power Act, 1903, included in the order.

Glastonbury.—The Council is taking legal and technical advice as to the legal aspects and the financial possibility of successfully combining the provision of electric light with its gas undertaking.

Greenock.—The deadlock which was threatened between Greenock and Port Glasgow on the question of the supplying by the former of electricity to Port Glasgow power users has happily been averted. Under an arrangement come to, Greenock is to be allowed to supply the shipbuilding firms of Port Glasgow, and the suggestion of applying for a prov. order on the part of the Port Glasgow Corporation has been dropped. Mr. Lithgow has also entered into an agreement with Port Glasgow T.C., which will allow him to make arrangements with Greenock to supply electric light to the houses in the Bay area. This contract between the two Corporations is to hold good for 30 years.

Hereford.—The annual report of the electrical engineer (Mr. W. T. Kerr) shows that the total number of consumers connected is now 664, an increase of 85, or 14 per cent. The output of units increased 11·3 per cent., chiefly in power units. Up to December, 1911, the total units increase for the nine months over the corresponding period for 1910 was 51,995, whereas, from January to March, 1912, there was a decreased output of 5,227 units, due to the coal strike and metal-filament lamps, notwithstanding the fact that 85 new consumers had been connected. The revenue up to December had increased by £382, the revenue for March being down £70, which, under normal conditions, should have been £120 up. The total costs, including interest, sinking fund and works cost, have fallen from 2·82d. to 2·716d.; the average price received has fallen to 2·348d., due to a drop in the output of higher priced units. The motor load portion of the business has developed considerably, there being 562 H.P. connected. The fittings account showed a net profit of £48, as compared with a loss of £94 last year. The net profit, after providing for interest, was £1,656, as

compared with £1,554. The net profit has been carried to the revenue account, and increased by £505 contributed from the borough fund, making a total of £2,161, out of which have been provided instalments of principal repaid, £800; instalments payable to the sinking fund, £1,375; and amount written off switchboard extension account, £100; leaving a deficiency for the year of £114. This, added to last year's deficiency of £371, makes a net deficiency to be carried forward of £486.

Highbridge.—The U.D.C. has asked Dr. Purves to submit in writing his proposal to extend the electricity cables to the town from Burnham.

Hipperholme.—The Lighting Committee has resolved that arrangements shall be made for the lighting of some of the street lamps in the district by electricity next year.

Japan.—The Tokio Electric Light Co. has considerably reduced its rates for the supply of electricity for power purposes and for the running of arc lamps, &c.

Kilmarnock.—A profit of £1,200 has been made on the electricity department for the past year.

King's Lynn.—The electricity accounts for the year ended March 31st last show a profit of £504, as compared with £1,034 in the previous year. It was explained at a Council meeting that the reduction in the profit was caused principally by the reduction of the price to ordinary consumers from 4½d. to 4d. per unit. Additional coal bought in view of the coal strike increased the expenditure by £150, and there was a falling-off of £100 in the profit on fittings. On the recommendation of the Committee £231 was ordered to be appropriated for reduction of capital account, and a sum equivalent to 1d. in the £ (about £330) to the relief of rates.

Launceston.—The T.C. on Monday had before it a tender received from Launceston and District Electric Supply Co., containing their terms for lighting parts of the town. Mr. E. Hicks said the price was a favourable one, but they had not suggested lighting the whole town. The question the Council had to consider was to make arrangements with the gas company for the other part of the town. The Council discussed the letter in committee.

Ledbury.—Messrs. Brown & Parsons, Ltd., electrical engineers, Leamington, have informed the U.D.C. that a syndicate has been formed for the purpose of supplying electricity to the town, and have asked for the Council's support. The Council has passed a resolution to the effect that it sees no reason to object to the proposal at this stage.

Leeds.—Mr. H. R. Hooper, of the L.G.B., held an inquiry on June 14th, concerning the application of the City Council for permission to borrow £58,960 for the purpose of providing additional generating plant with the necessary boilers and accessories at the Whitehall Road station. The application was opposed by Mr. Totty, acting for the Ratepayers' Association, whilst Alderman Badlay drew attention to the heavy indebtedness of the city which existed at present, and said that it would have been better not to have reduced the rates last year than to borrow money. The Town Clerk replied to the statements made by Mr. Totty and Alderman Badlay, and the inquiry was closed.

London.—City.—The *City Press*, commenting upon the recent rumour of a contemplated purchase by the Corporation of the undertaking of the City of London Electric Lighting Co., Ltd., says that it has every justification for announcing that no such step will be taken—at any rate, just yet. "The opinion of the Committee who have been considering the matter is that the purchase of the company would be inadvisable, because it would involve either the acquisition of the City undertaking of the Charing Cross Co., or entering into competition with that concern. The Committee will present a formal report on the subject to the Court of Common Council at an early date."

Lewisham.—The Guardians have accepted the estimate of the South Metropolitan Electric Light and Power Co., Ltd., at £30 11s. 8d. for lighting the various rooms and offices of the infirmary laundry, subject to the company offering to supply energy upon reasonable terms for a number of years.

Fulham.—A loan of £3,200 is to be taken up from the L.C.C. to defray the cost of the necessary cable extensions, transformers, &c., required in connection with the supply of energy to the Earl's Court Exhibition.

Mansfield.—A L.G.B. inquiry was held on June 12th into the application of the T.C. for a loan of £4,000 for electricity purposes. Mr. H. R. Hooper, the inspector, strongly advised the Council to purchase meters, for which £500 was applied for, out of revenue, instead of applying £500 to the relief of the rates. By doing that they would save £100 in five years.

Nelson.—With reference to the Council's application for sanction to borrow £3,000 for the purpose of electric lighting in the borough, an inquiry was recently held by the L.G.B., when it was stated that the estimated requirements for the next four years—including the period since sanction was applied for—included £848 for mains, £150 for boxes and pillars, and £1,244 for services, &c. The electrical undertaking was growing satisfactorily, and if the present rate of increase in the number of consumers was maintained, the sum for which sanction was asked would not suffice for so long a period as the four years. No opposition was raised against the proposal.

New Zealand.—The *Australian Mining Standard* states that the Auckland (N.Z.) City Council has recently erected a new power-house, at Mechanics' Bay, at a cost of £20,000. There are to be four sets of generators, which will enable the City Council to supply power to outside companies, if required.

Rawdon.—The Highway Committee is considering the question of lighting the public street lamps with electricity, and is asking the Yorkshire Power Co. its terms.

Rawtenstall.—The T.C. has applied to the L.G.B. for sanction to borrow £7,500 for the purposes of the electricity undertaking.

South Africa.—The Cape Town municipality is about to extend its electric lighting works, and also to purchase the interests of the Cape Peninsular Lighting Co., for which purposes a loan of £75,000 is being raised.—*British and South African Export Gazette.*

Southmolton.—Messrs. Crompton & Co., Ltd., have informed the T.C. that, as no Order for the electric lighting of the town can be obtained from the B. of T. until August of next year, they have decided not to proceed with the scheme.

Stafford.—The annual report of the electricity department shows that the revenue from all sources amounted to £5,493, and that the total expenditure was £2,684, leaving a gross profit of £2,809, compared with £2,730 last year. The total charges against net revenue account amounted to £2,171, leaving a net profit of £639, to which has to be added the amount brought forward £152, leaving an available balance of £792. From this the Committee proposes to transfer £600 to depreciation account, the same as last year, and after deducting the bonus to officials and workmen, to carry the balance forward. The total expenditure remains at £32,500, and the loans repaid amount to £14,911, leaving £17,589 now owing on this account. The bonus to officials and workmen amounts to 11·7 per cent. on the wages, as compared with 10·4, 7·9 and 7 per cent. in the three preceding years.

Surbiton.—According to Mr. J. F. C. Snell, in his half-yearly report on the electricity works, it appears that 31 new consumers have been added. The statistical and financial results for the year ended March 31st, 1912, are satisfactory, the sale of units having increased 15 per cent., and the average price per unit declined 4·6 per cent. The revenue has increased by 4¼ per cent., while the cost of production has only increased by 10 per cent The balance to net revenue has increased by 14 per cent., and the percentage of gross profit to capital expended has grown from 5·76 per cent. to 6·33 per cent. A deficit in 1911 of £300 has been converted into a net surplus (after paying capital charges) of £11. The plant has been maintained in good order, and there is every prospect of further advances in the progress of the department.

Sutton Coldfield.—The T.C. has applied to the L.G.B. for a loan of £2,000 for new plant for the electricity works.

Swinton and Pendlebury.—St. Stephen's School is to be wired for the electric light, and the Education Committee of the U.D.C. will supply the lamps and provide the renewals.

Taunton.—The annual balance-sheet of the Electricity Committee shows a gross profit on the year of £5,127. Of this sum £1,522 has been utilised for payment of interest on loans, and £2,659 in redemption of loans, while £600 has been transferred to the reserve fund.

Wakefield.—The T.C. referred back to the Committee for reconsideration a recommendation approving of the Bill promoted by the I.M.E.A., and agreeing to contribute £5 towards the expenses. The opposition was on the ground of municipal trading.

Weymouth.—The annual report of the electricity department shows the number of consumers to be 663, an increase of 128. The total connections showed a corresponding increase. The total number of units sold was 528,667; gross receipts amounted to £7,880, and gross expenditure to £3,631, leaving a gross profit of £4,249. The following special items were allowed for:—Interest on loans, £1,720; repayment of moneys borrowed, &c., £1,875. The profit on the year is £634. The Committee has agreed to forgo further loans for the purchase of meters, and has transferred £375 to reserve fund. The total capital expenditure has been £55,145, and £10,104 has been repaid. The electrical engineer (Mr. J. H. Bolam) reported that the growth in output had made necessary the nearly continuous running of the plant, which had naturally affected the works costs for the year, these having increased from 0·92d. per unit sold to 0·97d. The much higher price paid for coal, together with the extra running, accounted for the difference.

Whitwood Mere.—A L.G.B. inquiry was held on June 13th into the application of the U.D.C. for a loan of £3,300 for additions to the E.L. undertaking. There was no opposition.

Worcester.—The electricity accounts for the year ending March 31st, 1912, show a net deficiency of £676, as against an estimated deficit of £810. The electrical engineer (Mr. C. M. Shaw), in his report, points out that £198 for purchase of meters, £65 extra cost of fuel, caused by the coal strike, and £185 due to the change to the polyphase system, were not included in the

estimates. During the year 70 new customers were connected, the total demand being 35 per cent. greater than any previous year's record. Despite the use of metal-filament lamps, 32,014 additional units had been sold for lighting purposes. The demand for energy for power purposes had also increased. The costs of production showed a slight increase, being 339d. per unit sold. This was due to the increased cost of coal caused by the strike and the inability to generate much electricity by water-power at the station at Powick.

York.—On the 13th inst., Mr. T. C. Ekin held a L.G.B. inquiry into the Corporation's application to borrow £9,700 for the purpose of extending the generating and steam-raising plant. There was no opposition.

TRAMWAY and RAILWAY NOTES.

Australia.—After prolonged negotiations, says Reuter, a provisional agreement has been entered into by the Agent-General for Western Australia, on behalf of the Government of that State, and the directors of the Perth Electric Tramways, Ltd., for the purchase of the company's undertaking at £475,000, subject to legislative authority being obtained, and to ratification by the shareholders.

Continental Notes.—Germany.—A preliminary concession has been granted in respect of a projected electric tramway between St. Ingbert and Rohrbach, in the Pfaly district of Bavaria.

Austria.—It is estimated that the cost of the electrification of the Vienna Suburban Railway will amount to 30,000,000 kronen, and that of the building of the underground railways to 120,000,000 kronen.—*Financial News.*

Lisbon.—Reuter reports that the Federated Trade Unionists, who are supporting the tramway men now on strike, have decided to ask the Municipal Council of Lisbon to cancel its agreement with the Electric Tramway Co.

It is also stated that the first task of the new Cabinet will be to settle the tramway strike. The tramway company has enough men apart from the strikers to work the system, if they are protected. Stones were thrown at Mr. Alfred Giles, the Lisbon manager of the company, as he was leaving the works in a motor-car. He was slightly injured in the leg.

Dundee.—It was intimated at the last meeting of the Tramways Committee that the new railless traction system in Clepington Road would be in working order by the beginning of September.

Glasgow.—The working of the Corporation tramways, as suggested some weeks ago in the Review, has shown considerable falling-off in net income for the 12 months ending May 31st last, the figures being for the year ending May 31st, 1912, £52,068, against £68,678 for 1911. The deficiency is accounted for mainly by increases of wages to the general staff, which aggregated £28,000, the augmented price of coal during the miners' strike, the losses during the tramwaymen's strike, and increased third party insurance rates. An analysis of the tramway receipts is interesting in comparison with those of the previous 12 months. This shows that the traffic receipts for the past year were £987,280, against £946,021 in the previous 12 months; while other receipts accounted for £3,795, compared with £3,467. The total income was £991,075, against £949,488. From this there fell to be deducted £582,640 for working expenses (excluding depreciation) which last year reached £533,179, leaving this year a balance to be carried forward to net revenue account of £408,435, against £416,310 a year ago. To the latter had to be added £49,592 as interest on investments, and £180 derived from lines rented to Dumbarton Burgh and County Tramways Co.—the figures last year were respectively £43,214 and £230—which left this year a balance of £458,207, compared with £459,753 last May. Various expenditure had to be deducted from the total income. This year this amounted *in toto* to £406,140, against £391,075 12 months ago. These items, in contrast with those of last year, were respectively:—Rental of Govan and Ibrox tramways, £5,046, against £5,061; proportion of traffic receipts due to Paisley District Tramway Co., £5,271, against £4,966; interest on capital, £75,092, against £75,168; sinking fund, £93 863, against £89,794; income-tax, £13,028, against £13,492; Parliamentary expenses, £135, against £15; depreciation fund, £128,073, against £117,129; and permanent way renewals fund, £85,631, against £85,450.

Kilmarnock.—At a recent meeting of the T.C., it was reported that while the tramways showed an increase in revenue this year of £446, expenses had also increased, and there would be a deficit on the undertaking of about £2,000.

Lanarkshire.—A new situation has been created in connection with the promotion of a Bill by the County Council of Lanark to acquire, by compulsory purchase, the whole undertaking of the Lanarkshire Tramways Co., and the extension of the lines from New Stevenston by way of Bellshill to Uddingston. It is understood that an agreement has been arrived at between the County Council and the Tramway Co., whereby the county authorities are to find the capital for the immediate extension of the New Stevenston route, the company undertaking to work the line and repay the capital within two years. There exists, however, a signed agreement between the County Council and the T.C.'s of Hamilton, Motherwell, and Wishaw, for co-operation and joint purchase of the whole concern from the Tramway Co., and thus the new proposal has created altered conditions which have been the subject of discussion at a joint meeting of the three T.C.'s. The burghal authorities maintain that no negotiations should have been entered into without their knowledge and consent, and have appointed representatives to consult the Parliamentary agents in London as to the new situation.

Lancashire.—The promoters of the Preston, Chorley and Horwich Tramways Bill have obtained an extension of time in which to acquire lands for the purpose of road widening, following which the construction of the tramways will be proceeded with. The total length will be 15 or 16 miles.

Leeds.—Between the running of the last car on Saturday night and 8 o'clock on Monday morning, three hundred yards of tramway track were taken up, relaid with new rails, and repaired by the Corporation tramways department, without interfering with the service. The working party was composed of three shifts of 80 men each.

London.—It is expected that the Central London Railway extension to Liverpool Street will be opened at the end of July.

Woolwich.—A scheme is now being put forward for the reconstruction on the conduit system of the electric tramways between Chapel Street and the Free Ferry.

Luton.—The T.C. has applied to the B. of T. for an extension of time until August 11th, 1914, for the completion of the tramways under the order of 1905.

New Zealand.—According to the *Australian Mining Standard*, it is proposed to install an electric tramway service at Timaru, consisting of a double line, with a total length of about 6¾ miles. The estimated capital cost is £57,000; revenue £11,800 per annum; annual expenditure £10,400. Until hydro-electric power is available at a sufficiently low rate, the suggestion is to employ a Diesel oil engine at the power station.

Sale.—A new line of tramways from Sale Station to the Leigh Arms has been completed and is awaiting the sanction of the B. of T. Another extension is in progress from Alexandra Park Gates along Alexandra Road South to Chorlton.

Stalybridge.—Running has been recommenced on the Stalybridge, Hyde, Mossley and Dukinfield Tramways. During the stoppage, important repairs to cars and generating plant were effected.

Turkey.—Reuter states that a German syndicate, headed by the Deutsche Bank, is endeavouring to obtain the concession for an underground railway from Sultan Bayazid, in Stambul, to Chichli, the most outlying suburb on the other side of the Golden Horn. Negotiations are well advanced, and it is expected that an agreement will be reached at an early date. The Germans do not ask for any financial guarantees, so that the scheme will not require the approbation of Parliament. The line will cross the Golden Horn over a special bridge.

Another German syndicate obtained the concession some months ago for an electric railway from Galata, along the shore of the Bosphorus to the Black Sea. Engineers have surveyed the route, but, although the concession has been vested with Imperial sanction, it is understood that the promoters are not yet ready to float a company to carry on the undertaking.

The Deutsche Bank is also largely interested in the group which has taken over the concession of the Constantinople Tramway Co., and which has obtained the monopoly for the supply of electric power and light in Constantinople. The works for the electrification of the Constantinople tramways are being actively pushed forward, and it is announced that the first electric cars will be run between Galata and Ortakeuy this autumn. The group has also secured several important extensions to the lines already in being, and expects to push on the Ortakeuy line to Bebek within a couple of years.

U.S.A.—The *Times* reports that the strike of tramway men in Boston has paralysed many divisions. Men who have been working the tramways have been attacked, cars have been stoned and obstructions have been placed on the lines.

Watford.—On Saturday the L. and N.W. Railway, in pursuance of their scheme for a new electric line from Euston to Watford, opened two sections, namely Willesden to Harrow and Croxley Green to Watford. According to a daily paper the lines will not be electrified for some months, and as a temporary measure the old North London Railway stock will be used.

Worsborough.—At a meeting of the Council it was resolved "that the Council should urge upon the Barnsley Electric Traction Co. the desirability of making early arrangements for extending their lines from Worsborough Bridge terminus to Birdwell and Hoyland Common." As an alternative the Council may entertain the idea of promoting a motor service.

TELEGRAPH and TELEPHONE NOTES.

German Colonies.—The scheme for the establishment of a system of wireless telegraphy in connection with the German colonies in the South Sea, to which reference was made in the annual report of the German-Netherlands Telegraph Co. a short time ago, has now been advanced a stage by the intimation that the German Government has just granted a joint concession to this company and the Telefunken Co. for the construction and working of four coast stations, to be equipped with plant of a minimum of 120 H.P., the iron towers to be 400 ft. high. At present the South Sea colonies of Yap-Rabaul (New Guinea), Apia (Samoa) and Nauru have no telegraph connection. This disadvantage is to be overcome by the erection of wireless stations which are also to be connected with the island of Yap, where the German-Netherlands cable lands. It is proposed to form a separate company to carry out the undertaking. The distances of transmission are 1,364 miles between Yap and New Guinea, 2,108 miles between Yap and Nauru, 1,054 miles between New Guinea and Samoa, and 1,674 miles between Nauru and Samoa.

International Radio-Telegraphic Conference.—Yesterday the delegates were invited to inspect the Woolwich works of Messrs. Siemens Bros. & Co., Ltd., and witnessed a demonstration of the Telefunken system of wireless telegraphy, after which they were entertained to dinner by the company. To-morrow the delegates will visit the new works of Messrs. Marconi's Wireless Telegraph Co., Ltd., at Chelmsford, and will afterwards be the guests of the company at dinner at the Savoy Hotel.

The Telephone Service.—According to a recent statement of the P.M.G., tests made during six months with regard to 50,000 calls showed that the average time taken to answer was 5·1 seconds, and the average time to make a connection was 28·6 seconds. During the current financial year 2½ millions will be spent on the telephone service, apart from the payment to the National Telephone Co.

CONTRACTS OPEN and CLOSED.

OPEN.

Alford (Lincs.).—June 24th. Public lighting for the U.D.C. Mr. Thos. N. Loy, clerk.

Australia.—Western Australia.—July 31st. Postmaster-General's Dept. Telegraph and telephone material. See "Official Notices" to-day.

Victoria.—P.M.G., Melbourne.—July 23rd. Nine sections of a lamp-signalling trunk-line switchboard. See "Official Notices" April 5th.

N.S.W. Government Railways and Tramways.—July 1st.—200-KW. motor-generator set for the Ultimo Power House. Specifications from the Electrical Engineer's Office, 61, Hunter Street, Sydney.

New South Wales.—August 28th. Common battery and automatic switchboards, for Newton, Glebe and Balmain, for the Postmaster-General's department. See "Official Notices" to-day.

South Australia.—October 1st. Telephone switchboards at Unley, Adelaide, for the Postmaster-General's department. See "Official Notices" to-day.

October 1st.—Telephone switchboards at Norwood, for the P.M.G.'s department. See "Official Notices" to-day.

October 22nd.—Telephone switchboard at Port Adelaide, for the P.M.G.'s Department. See "Official Notices" to-day.

Birkenhead.—July 8th. Two 750-KW. mixed-pressure steam turbines and D.C. generators, with condensing plant, &c., and nine superheaters and interconnecting steam pipes, for the Corporation. See "Official Notices" to-day.

Blackburn.—The Health Committee has decided to seek tenders for electric lighting in the extensions to the local fever hospital, which are about to be carried out.

Bradford.—June 29th. Tramcar equipments, trucks, timber and car fittings, for the Corporation. See "Official Notices" June 14th.

Brazil.—July 15th. The Public Works authorities at Cuyaba (State of Matto-Grosso) are inviting tenders for the supply of electrical energy for lighting and power purposes in the town.

Croydon.—June 24th. Conversion of two hand lifts into automatic push-button control electric lifts, at the Infirmary, for the B. of G. See "Official Notices" June 7th.

Dewsbury.—July 4th. One 1,000-KW. turbine, two 500-KW. D.C. generators, and jet condensing plant for the T.C. See "Official Notices" June 14th.

Dublin.—June 27th. Extra-high-pressure and low-pressure cables, for the Corporation. See "Official Notices" June 7th.

Exminster.—June 22nd. Electrical appliances for a year, for the Devon County Lunatic Asylum. Mr. H. E. Morgan, clerk.

Gillingham (Kent).—June 24th. Coal, for the Corporation electricity works, for a year; Borough Electrical Engineer.

Glasgow.—The T.C. Electricity Committee has decided to advertise for offers for the erection of a sub-station in Elliott Street, Byres Road. Mr. W. W. Lackie.

Halifax.—The B.C. is inviting tenders for doubling the permanent way, and also for six new cars. Further particulars from the tramways department.

Hull.—June 24th. Mains for the Corporation Electricity Department. See "Official Notices" June 14th.

Hungary.—July 1st. The municipal authorities of Szekelyhid are inviting tenders for the concession for the public and private electric lighting of the town.

London.—Islington.—July 24th. One 3,000-KW. steam turbine alternator, with exciter, condensing plant, switchgear, piping, &c., for the B.C. See "Official Notices" June 14th.

Hackney.—June 27th. Boiler plant, induced-draught plant, economiser, feed pumps, coaling plant, pipework, travelling crane, turbo-alternator, motor-generator or motor-converter, switchgear, &c., for the B.C. See "Official Notices" May 17th.

Hammersmith.—June 26th. High and low-tension switchgear and cable, for the B.C. See "Official Notices" June 14th.

Stepney.—July 1st. The Electricity Supply Committee is inviting tenders for meters, demand indicators, time-switches and carbons. See "Official Notices" June 14th.

L.C.C.—July 2nd. Electrical installation at the Old Kent Road special school and divisional offices. See "Official Notices" to-day.

Manchester.—June 28th. Traction feeder cables and two years' supply of transformers, D.C. and A.C. motor starting switches, time switches and clock-controlled circuit-breakers, D.C. and A.C. motors, and meters, for the Corporation. See "Official Notices" June 14th.

Neath.—July 4th. Overhead and underground high-tension cables and transformer pillars, for the R.D.C. See "Official Notices" to-day.

Newcastle-upon-Tyne.—June 28th. Nine-ton electrically-driven crane for use in connection with an anti-coal breakage appliance at No. 5 Coal Shipping Staith, Whitehill Point, for the Tyne Improvement Commission. Deposit £1. Mr. J. M. Manson, general manager and secretary, Tyne Improvement Commission.

New Zealand.—August 1st. Public Works Department. The following plant is required in connection with the Lake Coleridge electric power scheme. Section 3A.—Valves and expansion joints. Section 10A.—Steel standards for transmission lines. Section 10B.—Ferro-concrete standards for distribution line. Tenders to the Minister of Public Works, Public Works Office, Wellington, N.Z., from whom specification, &c., can be obtained. Deposit £200.—*Board of Trade Journal.*

Oldham.—June 21st. Steam, exhaust, drain and condenser pipes, oil separator, &c., for the Corporation Electricity Committee. See "Official Notices" May 31st.

Portsmouth.—June 27th. Permanent way material and electrical equipment in connection with the Twyford Avenue tramways route, for the Corporation. See "Official Notices" June 14th.

Rotherham.—July 8th. (*a*) Tramway stores and materials for a year for the T.C., and (*b*) Electricity meters. (*a*) Tramways manager; (*b*) Borough electrical engineer.

July 8th.—Smudge or pea nuts for a year for the Corporation electricity works; Borough Electrical Engineer.

Salford.—June 24th. Coal for a year, for the Corporation electricity works; Electrical Engineer, Frederick Road, Pendleton.

Sheffield.—June 28th. Roof principals and structural steelwork, for Neepsend power station extension, for the Corporation. See "Official Notices" June 14th.

Spain.—June 30th. The municipal authorities of Puebla del Caraminal (province of Coruna) are inviting tenders for the concession for the electric lighting of the town during a period of 15 years. Particulars may be obtained from, and tenders are to be sent to, El Secretario del Ayuntamiento de Puebla del Caraminal (Coruna).

July 2nd.—Tenders are being invited by the municipal authorities of Calonge (province of Gerona) for the concession of the electric lighting of the town during a period of 10 years. Tenders are to be sent to El Secretario del Ayuntamiento de Calonge (Gerona), whence particulars can be obtained.

Swindon.—June 22nd. Steam coal, for the Corporation. See "Official Notices" June 7th.

Swinton.—June 25th. Electric light installation at the Refuse Destructor, for the U.D.C. See "Official Notices" June 14th

Sunderland.—June 27th. Cooling tower, travelling crane and switchgear, for the Corporation. See "Official Notices" June 14th.

Warrington.—June 25th. E.H.T. cable, for the Corporation. See "Official Notices" June 14th.

Worksop.—July 3rd. Battery switchboard and cast-iron exhaust pipes, for the U.D.C. See "Official Notices" June 14th.

Worthing. — June 24th. Coal for the Corporation Electricity Works. W. Verrall, town clerk.

CLOSED.

Australia.—The following contracts have been placed, according to the *Australian Mining Standard*:—

VICTORIAN RAILWAYS DEPARTMENT.

Australian General Electric Co.—Tramcar equipment, £2,957.
Westinghouse Brake Co.—Brake gear, £1,844.
Vanderkelen & Co.—Galvanised telegraph wire, £525.
Noyes Bros. Proprietary, Ltd.—Truck material, £863.
Bullers, Ltd.—Insulators, £250.
Automatic Telephones (Australia), Ltd.—Automatic telephone switchboard, £2,439.
Automatic Telephones (Australia), Ltd.—200 telephone sets, at £2 19s. 6d. each.

SYDNEY MUNICIPAL COUNCIL.

W. T. Henley's Telegraph Works Co., Ltd.—11,000-volt ·05 three-core cable, £3,684.
Noyes Bros.—10,000-volt switchgear and transformers, £2,618.
Stewarts & Lloyds, steel poles, £1,675; Ferranti, Ltd., D.C. meters, £900; Australian General Electric Co., A.C. meters, £1,000; B.I. and Helsby Cables, Ltd., overhead cable, £10,980; Noyes Bros., sub-station switchgear and transformers, £2,289; Australian General Electric Co., lightning arresters, £302; earth detectors, £218; link switches, £307; also other switchgear, £1,509.

BRISBANE WATER AND SEWERAGE BOARD.

Large pumping plant (only tender submitted), Thompson & Co., Castlemaine, £106,000.

PRAHRAN AND MALVERN TRAMWAYS TRUST.

Stewart & Lloyds.—Steel tramway poles, £7,739.

P.M.G.'s DEPARTMENT, BRISBANE.

1,000 Callaud cells, 2,000 glass cells for Meidinger battery, and 3,000 porous pots for Daniell cells.—Brisbane Electrical Co.
10,000 corks and tubes for Meidinger batteries.—I.R.G.P. and T. Works Co.
6,500 glass cells.—British General Electric Co.

Barnsley.—The Corporation has accepted the tender of the Tudor Accumulator Co., Ltd., to maintain the traction battery at the electricity works for 10 years for £108 per annum.

Bedford.—The T.C. has accepted the tender of W. H. Allen, Son & Co., Ltd., for new parts and repairs to No. 9 engine at the electricity works, at £293.

Belgium.—Five concerns submitted tenders last week to the Société Nationale des Chemins de Fer Vicinaux, of Brussels, for the construction of the overhead equipment of the La Rone-Zuen section of the light electric railway between Brussels and Hal, the lowest being that of Messrs. F. & R. Lemoine.

La Société des Ateliers de Constructions Electrique, of Charleroi, submitted the lowest tender to the Belgian military authorities for the supply and laying of a system of sub-river and underground telephone cables in the fortified portion of Antwerp.

Birkenhead.—The Guardians, on the recommendation of a Committee, advised by Messrs. Sloan & Lloyd Barnes, accepted the tender of the Northern Electrical and Ventilating Co., of Liverpool, at £2,217, for the electric installation at the workhouse. It was mentioned in the course of the discussion that a Birkenhead tenderer had submitted an offer at £800 less than that recommended, and that between the lowest and highest tenders there was a difference of over £1,000. One of the speakers said that some of the contractors who had sent in very low tenders, now admitted that they had no idea what they were tendering for, and that the job was far above them. An amendment referring the matter back on the ground that the lower tenders should be reconsidered, was lost by 18 votes to 3.

Glasgow.—The T.C. Electricity Committee recommend acceptance of the following offers:—

Kelvin & James White, Ltd., direct-current switchboards and instruments for the sub-stations in Osborne Street, Dennistoun, and Byres Road, £2,486.
British Thomson-Houston Co., Ltd., high-tension switchboards and instruments for sub-stations in Maryhill, and Byres Road, £1,146.
A. Reyrolle & Co., Ltd., high-tension switchboards and instruments for Osborne Street sub-station, £656 10s.

Acceptance of the following was also recommended:—

John Smith (Keighly), Ltd., £147, one overhead travelling crane for Osborne Street sub-station.
Carrick & Ritchie, Ltd., one overhead travelling crane for each of the following stations:—Dennistoun sub-station, £137; Byres Road, £59; Maryhill, £140.

Hindley (near Wigan).—The U.D.C. has accepted the tender of the Corlett Electrical Engineering Co., Ltd., for a motor and pump for sewerage purposes.

Mansfield.—The Corporation has accepted Messrs. Chamberlain & Hookham's tender for electricity meters for the coming year.

Runcorn.—The U.D.C. has sealed contracts with the British Westinghouse Electric and Manufacturing Co., Ltd., Mr. Thos. W. Ward, and Messrs. W. Farrell & Son, in connection with the electrification of the pumping plant

London.—L.C.C.—The following tenders were received for laying stoneware ducts, repaving, &c., in connection with tramways:—

J. A. Ewart	(accepted)	£1,819
Airds, Ltd.		1,999
Reid Bros., Engineers, Ltd.		2,078
J. Mowlem & Co., Ltd.		2,269

For overhead poles for the tramway extension in East India Dock Road the tenders received were:—

Clough, Smith & Co., Ltd.	(accepted)	£157
V. Watlington & Co., Ltd.		162
John Spencer, Ltd.		163
Dick, Kerr & Co., Ltd.		168
British Mannesmann Tube Co., Ltd.	(incomplete)	141
" " "	Do.	137
Chief officer's estimate		146

The Highways Committee accepted tenders from the following firms for brushes for electrical machinery for the year 1912-1913:—Morgan Crucible Co., Ltd., Sloan Electrical Co., Ltd., and W. Geipel & Co.; also that of Siemens Bros. & Co., Ltd., for electric cable, &c., and that of Wilsons, Pease & Co., Ltd., for special iron castings.

The tenders received for the renewal of the electrical installation at Blackwall Tunnel were as follows:—

G. E. Taylor & Co.	(accepted)	£3,485
Tilley Bros.		3,537
Pinching & Walton		3,604
Drake & Gorham, Ltd.		4,305
Duncan Watson & Co.		4,464
Chief engineer's estimate		3,560

The tender of W. T. Henley's Telegraph Works Co., Ltd., at £155, has been accepted by the Metropolitan Asylums Board for supplying and erecting three concentric feeder cables at the Grove Hospital. The other tenders received were Western Electric Co., Ltd., £160; Siemens Bros. & Co., Ltd., £161; W. T. Glover & Co., Ltd., £163; British Insulated & Helsby Cables, Ltd., £165; Callender's Cable and Construction Co., Ltd., £174.

FULHAM.—The tender of Phillips & Co., Ltd., has been accepted by the B.C. for the supply of 100 tons of Kirkby ½-in. coal, at 11s. 11d. per ton, for the Electricity Works.

Southampton.—The T.C. has accepted the tender of Mr. John Douglas, at £2,571, for reconstructing the tramways in Shirley Road.

Walsall.—With reference to the notice in our last issue respecting the Spencer-Dawson brake supplied to Walsall, we are informed that the price quoted only applies to the trial brakes purchased.

West Bromwich.—The Electricity Committee of the T.C. has accepted the tender of the Underfeed Stoker Co. for two underfeed stokers, at £285.

Whitby.—The North Riding of Yorks E.C. has accepted the tender of Mr. Robert M. Catterson-Smith, of Birmingham, for electric fittings for the Assemby Hall of Whitby Secondary School, at £79.

Worksop.—The U.D.C. has accepted the tender of the Tudor Accumulator Co., Ltd., for a storage battery, at £1,357, and for maintenance for 10 years, at £81 per annum.

The Council has also accepted the tender of the Wigan Coal and Iron Co., Ltd., for coal for the electricity works.

FORTHCOMING EVENTS.

Exhibition of Non-Ferrous Metals.—At the Royal Agricultural Hall, Islington, N. This exhibition is open daily to June 28th.

I.M.E.A.—Friday, June 21st. Closing meeting at Harrogate.

Association of Engineers-in-Charge.—Saturday, June 22nd. At 2.45 p.m. Visit to the Royal Naval College, Greenwich.

Thursday, June 27th.—At 7 p.m. Visit to the Exhibition of Non-Ferrous Metals, Agricultural Hall.

Physical Society.—Friday, June 28th. At 5 p.m. At the Imperial College of Science, South Kensington. Papers on "Hysteresis Loss as affected by Previous Magnetic History," by Prof. Ernest Wilson and Messrs. B. C. Clayton and A. E. Power; "The Efficiency of Generation of High-frequency Oscillations by Means of an Induction Coil and Ordinary Spark Gap," by Prof. G. W. O. Howe and Mr. J. D. Peattie; "Dielectric Hysteresis at Low Frequencies," by Prof. W. M. Thornton: and "Self-Demagnetisation of Steel," by Messrs. S. W. J. Smith and J. Guild.

Optical Convention.—On Wednesday the Optical Convention was opened at the Royal College of Science, London, by the President, Dr. S. P. Thompson; the programme of meetings extends to Wednesday next week, and an interesting and exhaustive collecton of British optical manufactures and apparatus of historical interest has been brought together. Numerous papers on optical and allied subjects are being read during the convention, and a remarkable work of reference in the form of a descriptive catalogue has been prepared by an expert committee, with the assistance of the staff of the National Physical Laboratory.

ELECTRIC DRIVING IN A KEIGHLEY MILL.

THE town of Keighley is the centre of a thriving textile and machine-making industry, which offers considerable scope for the modernising influence of the electrical engineer, and in the Keighley district some quite modern examples of electrical individual and group driving are to be found in local mills.

Merely to drive a mill electrically is a comparatively simple matter, but to drive it in such a manner as shall ensure commercially satisfactory results, beneficial alike to the textile and electrical industries, requires most careful discrimination and tact on the part of the engineer, especially when variations from customary and long-tried methods are involved.

For the adoption of electricity in connection with an old-time process generally introduces a new set of conditions, lack of appreciation of which too often deprives people of the full benefits obtainable under electrical operation; and in the case of a mill, it must be remembered that the benefits to be derived are not always large ones.

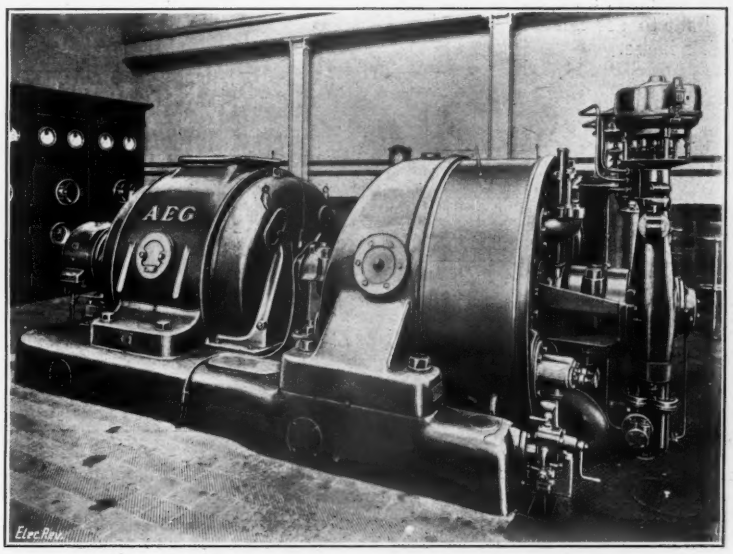


FIG. 1.—A.E.G. TURBO-ALTERNATOR AND EXCITER.

One of the most interesting examples of mill electrification in the Keighley district is that which has recently been carried out at Messrs. Robt. Clough's mills at Ingrow.

Messrs. Clough were not exactly strangers to electrical methods, having for three years operated a newly built electrically-driven mill in the town of Keighley, but nevertheless all credit is due to them for the progressive policy which resulted in the more recent and much larger development at Ingrow.

The mills in question consist of a fairly modern group of buildings known as the New and Alexandra Mills, and an old mill a short distance away.

A plan of the general lay-out is shown in fig. 3. Messrs. Clough are engaged in the worsted trade, and the New and Alexandra Mills contain the usual complement of combing, drawing, spinning and weaving machinery. The New Mill was originally driven by a beam engine, but when the Alexandra extension was decided upon a cross-compound Corliss engine was installed to drive by ropes to the head shafts in the usual way.

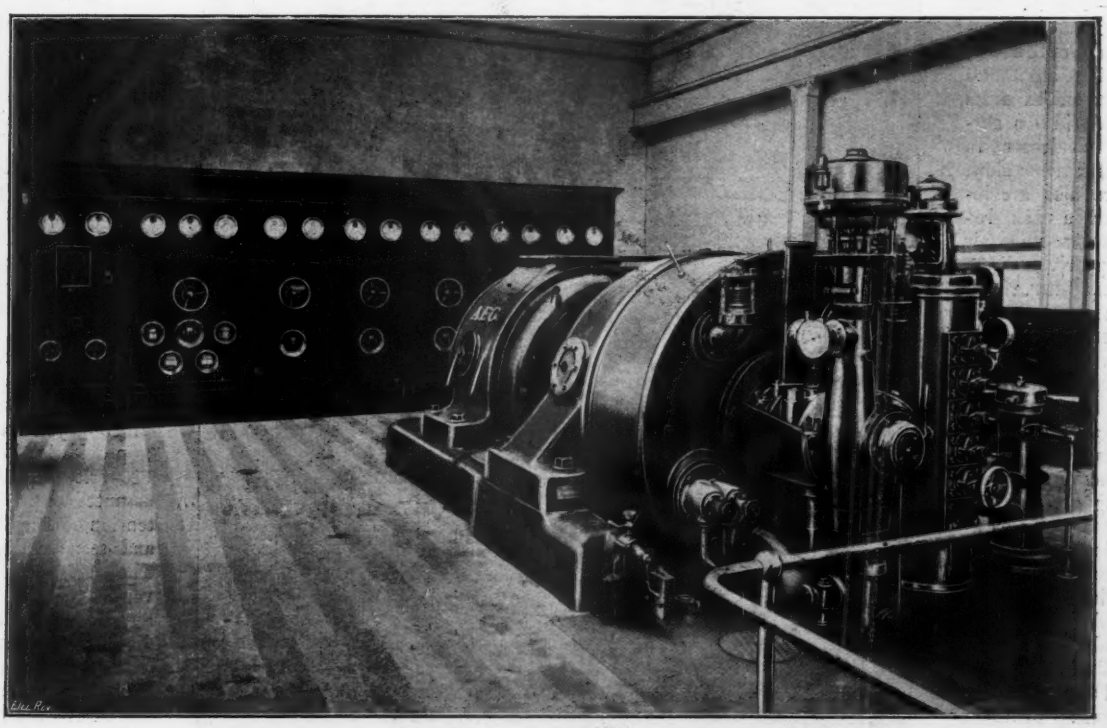


FIG. 2.—GENERAL VIEW OF ENGINE ROOM, MESSRS. CLOUGH'S MILLS, INGROW.

The addition of the Alexandra Mill at one end of the New Mill makes a long drive, but notwithstanding the difficulty, the arrangement was well thought out.

The old mill lies about 120 yd. from the main group. This was driven by a 200-H.P. engine assisted by a

water turbine of about 50 H.P. Thus the three mills were driven by two engines. Messrs. Clough realised the importance of centralising their power plant, and that great economies were to be effected by shutting down the two widely separated engines and supplying all their power from a central point, and this consideration, perhaps, carried the greatest weight with them. Upon arriving at the decision to discard the old drive, Messrs. Clough called in Mr. W. O. Pepper, of Bradford, as their consulting engineer, and, on his advice, a modern turbo-electric plant has been installed, a large and handsome engine house having been built to accommodate the plant, adjacent to the existing boiler house.

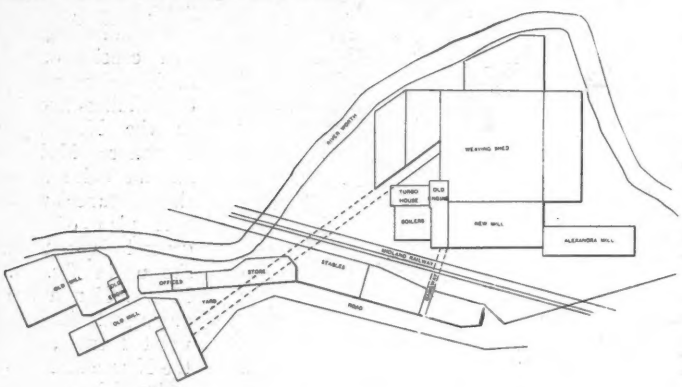


FIG. 3.—PLAN OF MESSRS. CLOUGH'S MILLS, INGROW.

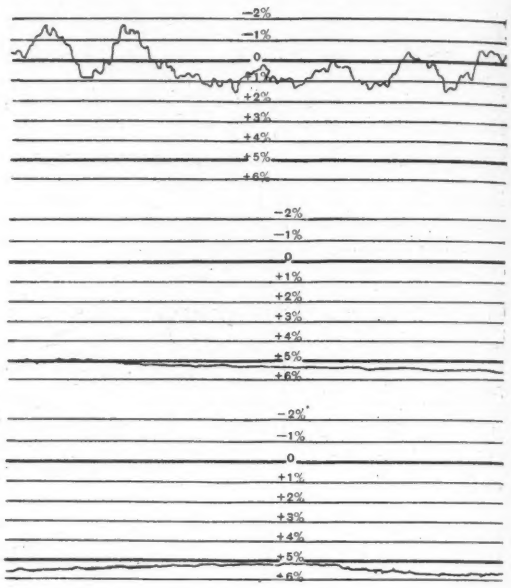


FIG. 4.—TACHOGRAPH CHARTS, SPINNING ROOM, WITH STEAM AND ELECTRIC DRIVE.

We illustrate in fig. 2 this engine room, with its short and compact 1,250-K.V.A. three-phase turbo-alternator, and main switchboard controlling the various mill circuits; the plant is of the well-known A.E.G. type. Steam is supplied at about 160 lb. pressure, superheated 150—200° F. The turbine is a two-stage machine, running at 3,000 R.P.M., and exhausts directly into a surface condenser in the basement below, where also are installed a single-throw two-stage air pump driven direct by an 18-H.P. three-phase motor, and a 20-H.P. motor-driven circulating pump with main and liquid starting switches, also the necessary pipe work, a view of this plant being given in fig. 5. The circulating water is taken from a stream flowing near by, which, we understand, provides an ample volume of cold water at all seasons. Provision is made, in case the circulating motor or pump should break down, for utilising water from a pipe with an 18-ft. head. The water can be directed through the condenser and will maintain a vacuum of 18-19 in.

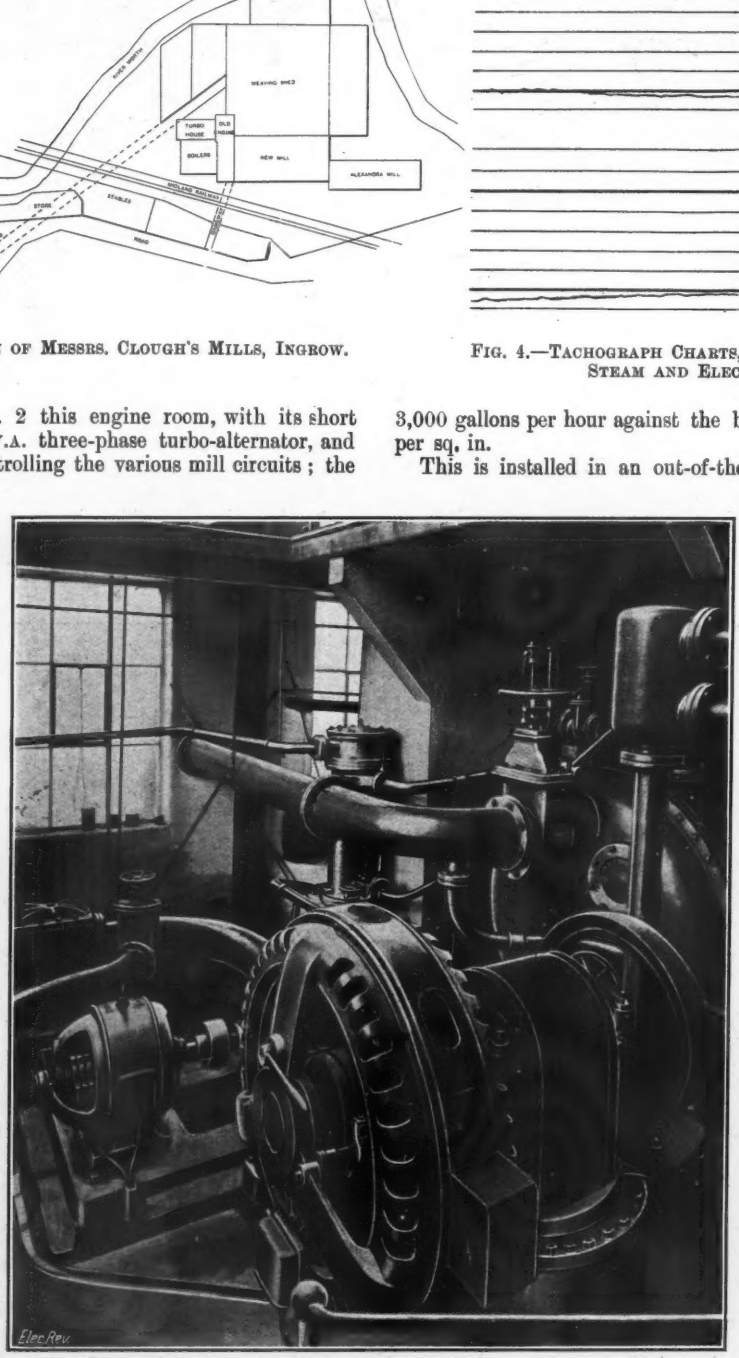


FIG. 5.—CONDENSING PLANT, MESSRS. CLOUGH'S INSTALLATION.

This arrangement, which provides an effective stand-by, was suggested by Messrs. Clough's engineer, to whom Mr. Pepper expresses his indebtedness.

An entirely new departure in mill working is the comparatively tiny centrifugal boiler-feed pump designed to feed 3,000 gallons per hour against the boiler pressure of 160 lb. per sq. in.

This is installed in an out-of-the-way corner, and when once set for the load will continue feeding automatically throughout the run.

A Lea recorder is installed to measure the condensed water from the turbine or the whole of the boiler requirements at will. With the integrating wattmeter on the switchboard, the Lea recorder affords a ready and acurate means of taking a water test at a few minutes' notice.

The main generator supplies current at 525 volts and 50 cycles, and is provided with a 110-volt exciter mounted on an extension of the bed, and seen in fig. 1. The generator is ventilated by filtered air, which is discharged through a sheet-iron duct.

The switchboard is of the A.E.G. iron-clad type, fig. 6, with the instruments let in flush with the face of the panels, and only the oil-switch operating wheels projecting; it consists of one generator panel, equipped with a three-pole main oil switch with overload time relays, main watt-hour meter, power-factor meter, ammeters, &c., and adjoining it a panel

carrying a Tirrill regulator, field regulating switches and the necessary instruments, also five feeder panels each with a main oil switch, watt-hour meter, and ammeters in two phases. The back of the board containing the bus-bars, switch mechanism, &c., is enclosed by a grill partition, and as our view indicates, a very safe and workmanlike arrangement has been adopted. No greater contrast can be imagined than that between the original slow-running multi-cylinder horizontal engines, and the small, compact and cleanly turbo-electric plant now installed.

Turning to the various mill-drives, in the new mill five 100-B.H.P. induction motors, running at 600 R.P.M., are installed for driving the combing, drawing and three spinning rooms. The motors are conveniently situated in storerooms by the lift race at one end of the building, which are separated from the mill itself by fireproof doors. The arrangement adopted, which is common to all the motors, is shown in figs. 10 and 11, where the necessary switch-gear, consisting of an ironclad circuit-breaker, with overload and no-load trips, combined with an ammeter in the top of the case, and the liquid starter are also clearly indicated.

A similar motor of 125 B.H.P. at 500 R.P.M. is installed in an annexe to the weaving shed for driving the weaving, dyeing and finishing machinery.

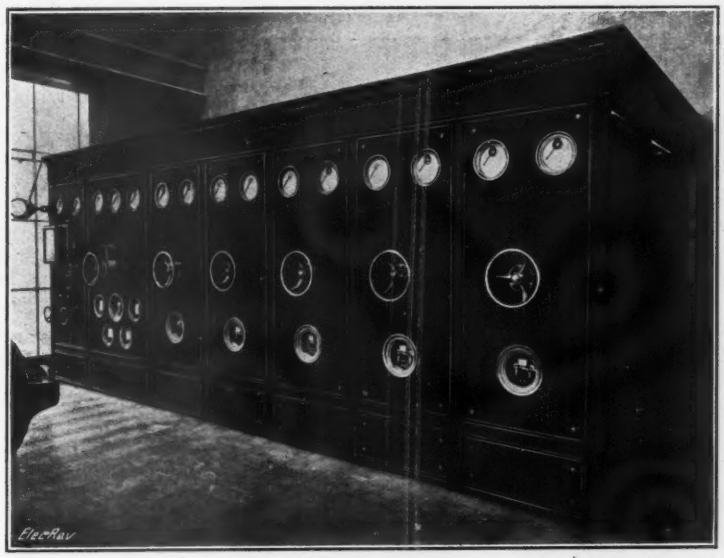
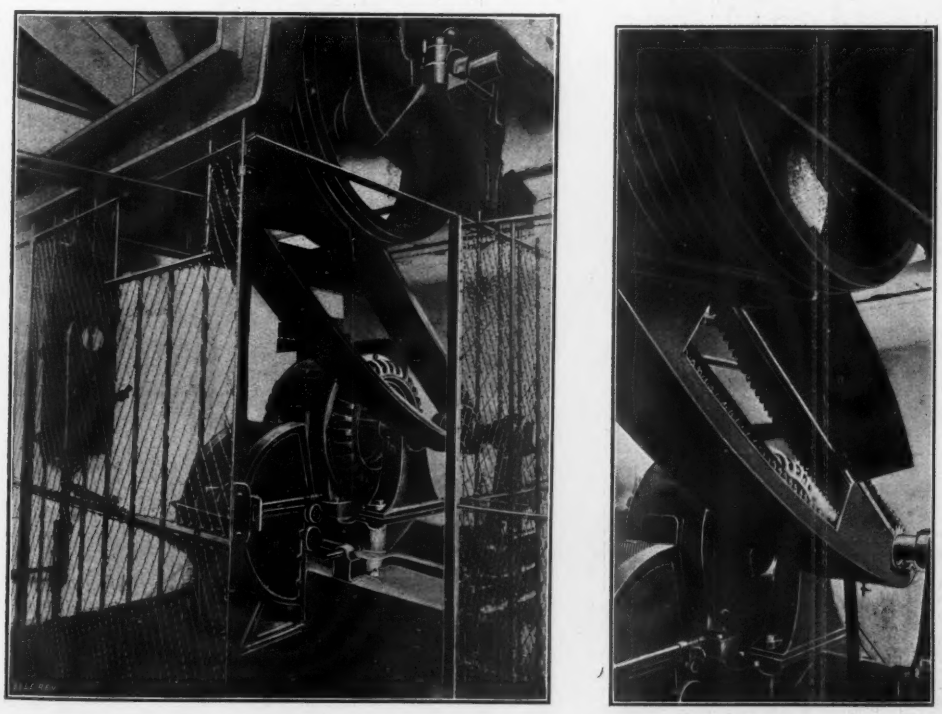


FIG. 6.—MAIN SWITCHBOARD, MESSRS. CLOUGH'S INSTALLATION.

Again, in the Alexandra Mills a 150-B.H.P. motor, running at 500 R.P.M., shown in figs. 7 and 8, and two 75-B.H.P. motors, speed 600 R.P.M., of which one is shown in fig. 9, are installed for driving spinning machinery, these motors being enclosed in metal grillages.

In connection with the above, perhaps the most striking feature is that in each case the drive is by means of a Hans-Renold chain on to the old line shafting running at from 160 to 190 R.P.M.



FIGS. 7 AND 8.—LARGE MOTOR, ALEXANDRA MILLS; CHAIN SHOWN RUNNING AND WITH GUARD.

These chains, which are indistinguishable from belt drives in our views, owing to their having been photographed while running, vary from 4 in. to 9½ in. in width, and are claimed to have a driving efficiency of 98 per cent. which is maintained in use. We believe this is the first example of a textile mill in which the chain drive from a motor has been employed throughout; there is little doubt, however, that the arrangement is a very satisfactory one under the conditions existing in these mills, and that it solved several difficult problems in connection with the conversion.

Western Electric three-core bitumen wire-armoured feeder cables running through the disused rope race connect the main switch panels to bus-bar boxes, from which branch feeders connect to motors; one main also supplies the old mill, where about 240 H.P. in motors is required.

The installation is a good example of the modern centralised power plant, and shows the facility with which power can be carried to any awkwardly placed shed or new extension. We understand that it is too early to speak of results, but an example of the improved running of the shafting may be gathered from the tachograph charts on a spinning-room shaft before and after conversion, shown in fig. 4.

In conclusion, we are much indebted to Messrs. Clough and to Mr. Pepper, their consulting engineer, for allowing us to describe and illustrate an installation which possesses many features of more than usual merit.

The turbo-electric plant and motors are of the well-known A.E.G. type, and their interests have been handled by Mr. W. Kobs, manager of the Leeds office, to whom also our thanks are due.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

Several recent accidents to linemen working on overhead wires in Toronto, two resulting in the death of the unfortunate workmen, have again brought into prominence the danger of having overhead wires, particularly in large cities where large numbers of conductors cross and recross each other to such an extent that it is almost impossible for any workman attending to them to avoid coming into contact with them. In one case a telephone wire was in contact with a wire at 2,200 volts and also with an iron brace used to hold the cross-arm rigidly in place; the man touched the brace, which he expected to be dead, and received a shock which resulted in his death. The tangled and hopeless state of confusion of overhead wires which is allowed over here needs to be seen to be appreciated—no wonder people are beginning to ask that the wires should go underground.

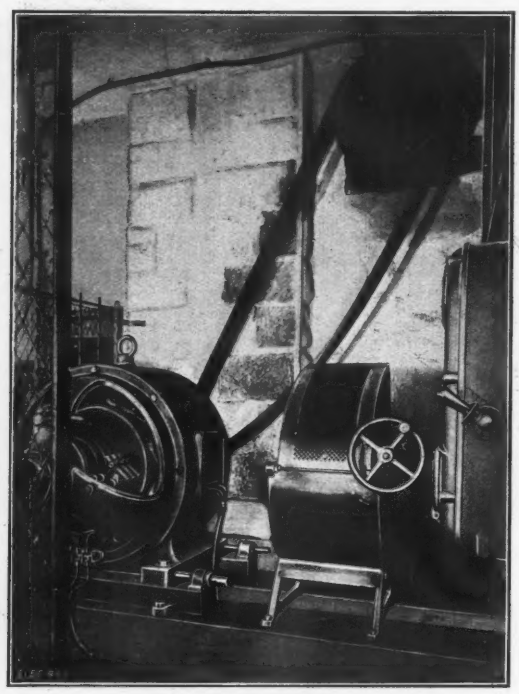


Fig. 9.—75-h.p. Motor Driving Spinning Machinery.

There is a possibility that the Canadian Northern Railway line, between Ottawa and Montreal, will be electrified, and it is reported that the electrification of the line entering Toronto may be carried out before very long. A radial electric railway is to be built to connect Toronto and Guelph, which are about 50 miles apart. Hamilton also is to be connected with Toronto in a similar manner. Hamilton lies some 40 miles south-west of Toronto, and is rapidly becoming an important manufacturing centre; being close to Niagara it is well supplied with power, and as it is on the shore of lake Ontario, and has good railway connections, it is favourably situated.

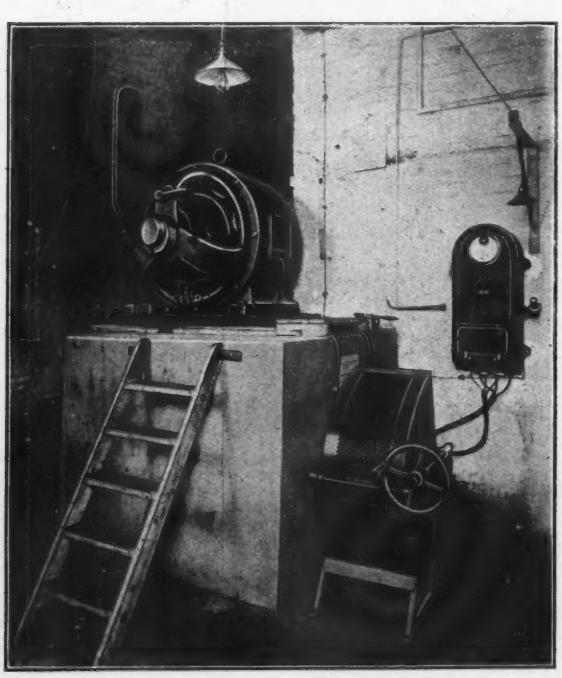
The authorities presiding over the Technical Schools of Toronto have just decided to give four-year industrial courses free of charge, and employers are to be asked to co-operate by permitting boys to attend classes during working hours, twice a week.

Arrangements are being made by the Hydro-Electric Power Commission of Ontario to give a practical demonstration of the application of electricity to farm work, and it is intended to show on a farm pumps, churns, cream separators, choppers, &c., in actual operation.

512, Continental Life Building, Toronto.

Conditions in Canada.—After all that we and our Canadian correspondent have said regarding the difficulties confronting British engineering firms in Canada, the following private letter received by a correspondent may be left to speak for itself :—

"The British Columbia Electric Railway Co., who, as you know, are purely an English concern controlled from London, with English engineers on this side, and an English general manager, have just placed an order for over $600,000 worth of steam turbine and boiler work with the C. C. Moore Co., of Seattle, and I think it is time that some of you fellows brought this matter up in the English technical papers, as this sort of thing is killing business in Canada, and the B.C.E. Railway apparently buy everything in America. The chief engineer . . . . has now placed the order with the Allis-Chalmers Co. without even competition, and as the English papers seem to be boosting Canada and its great possibilities, I should like to see someone tell them exactly how things stand out here. Practically all the big jobs in every line of business go to the States."



Figs. 10 and 11.—Typical Motor Installations in Store Rooms at Messrs. Clough's New Mill.

NOTES.

Engineers' Club for Manchester.—A strongly-supported movement is on foot in Manchester for the formation of a club for engineers and others who are intimately connected with engineering. Its objects are to be these :—(1) To provide a means of social intercourse and the usual club facilities for those who are concerned with engineering ; (2) to meet the convenience of members whose business causes them to visit Manchester ; (3) to provide a hall for technical and social meetings ; (4) to establish a home for a technical library.

According to the outline of the proposed constitution, its membership will be open to the following :—

1. Gentlemen engaged in the design, superintendence, direction or control (technical or commercial) of engineering and chemical works or operations.
2. A limited number of gentlemen intimately connected with engineering, and whom, in the opinion of the Committee, it would be an advantage to the club to enrol as members.
3. Life members may be admitted on payment of a suitable fee.
4. Country members. (Under conditions to be determined.)

It is proposed that the entrance fee shall be £3 3s., and the subscription £3 3s. per annum. Those who signify their intention of becoming members before July 1st, 1912, and are duly elected and pay their subscriptions within one month of their election, will be deemed original members, and admitted without entrance fee.

Mr. A. L. Green, of 8, Westminster Avenue, Manley Park, Manchester, is acting as secretary (*pro tem.*). In a circular issued by him at the instruction of a Committee, composed of members of the Councils of local Technical Societies, he says :—"It is considered that a membership of 500 persons would justify the formation of such a club. . . . The idea has met with general approval from such individuals as have already been approached personally."

A meeting will be called at an early date of all those who may have intimated their desire to join, and a Committee will then be appointed to draw up a constitution and undertake the initiation and management of the club.

The Electrical Contractors' Association (Inc.).—On Monday last the annual dinner of this Association was held at Frascati's. The President, Mr. G. Harland Bowden, occupied the chair, and was supported by the President-elect, Mr. W. A. Shaw, and other officers and friends of the Association. After the loyal toasts had been duly honoured, Mr. A. H. Dykes proposed "The Electrical Contractors' Association," which, he said, now numbered over 400 members, with nearly 20 branches, and was unquestionably doing useful work. He referred to the position the Association would occupy 20 years hence, in the "all-electric" era, when the wireman would be the household friend—though doubtless wires would be dispensed with by that time, and all lighting, cooking and heating would be accomplished by wireless transmission from plant at the pit's mouth. When he was chairman of a municipal electricity committee which possessed wiring powers, his committee provided the funds, but did all the work through contractors, and he was emphatically of opinion that that was the proper course to follow ; but he had heard that day that the I.M.E.A. Bill had been dropped, so they could rest in peace. He hoped the Association of Consulting Engineers would in the future enter into cordial relations with the Electrical Contractors' Association, to their mutual advantage, and concluded with a reference to the indefatigable activities of the secretary, Mr. L. G. Tate, and the President, Mr. Bowden.

In reply, Mr. R. Tweedy Smith (Hon. Solicitor) said he thought it was time an "electrical Parliament" was organised, on which all the various electrical associations should be represented ; the E.C.A. already had great influence with the authorities, and the electrical Parliament would be still more powerful. He foreshadowed for the coming year further progress in the work of the Association such as their opponents hardly dreamt of.

Mr. W. R. Rawlings proposed the toast of the I.E.E., the B.E.A.M.A. and kindred Associations, remarking on the good work done by the I.E.E. during the last year or two, and the prospect that, with the aid of commercial members, still better work would be accomplished in the future, through the operations of the Industrial Committee. The B.E.A.M.A. had carried out a very fine exhibition, with good financial results to themselves ; a great work remained for them—to teach manufacturers outside the Association to carry on business on legitimate lines. He welcomed Mr. Dykes's remarks on municipal wiring, and expressed the hope that the consultant who was neither consulting engineer nor contractor would be crushed out. The Municipal Electrical Association were seeking powers which, they said, they would not exercise if they got them ; by so doing they were alarming the industry and hampering the contractor.

Mr. A. B. Anderson, in his reply, emphasised the fact that very often the best way to help oneself was to help one another ; in the Manufacturers' Association that feeling was growing strongly, and when the buyer realised that the manufacturer was also his customer, they would all appreciate more fully their mutual interdependence. He was sorry the Municipal Bill had been dropped, for a compromise had nearly been reached through the Industrial Committee of the I.E.E. ; and a satisfactory compromise would have afforded a more desirable ending to the struggle. Regarding the Exhibition, he pointed out that the profit was earned on money put up by the manufacturers themselves.

Mr. Ll. B. Atkinson replied on behalf of the Cable-Makers' Association, whose relations with the E.C.A. had been most friendly for many years ; the arrangement between them had achieved a large measure of success, but a number of members of the E.C.A. unfortunately had not fully carried it out—otherwise the benefits to those who had done so would have been greater. Some said the Cable-Makers had not borne their full share of the keen competition which obtained, and the C.M.A. had been much abused ; but it had striven to maintain the high quality for which British-made cables were famous throughout the world, and had not reaped exorbitant profits. The ordinary capital of the cable companies was very small ; in the case of four of the largest firms, altogether four million pounds was occupied, of which scarcely 25 per cent. received the large dividends. In the early days these companies built up large reserve funds—½ to ¾ million—which were invested in the business and on which no dividends were paid ; if the profits were divided over the whole of the capital, they were only making a little over 5½ per cent., which was not an unreasonable return.

Mr. A. Rashleigh Phipps proposed the healths of the retiring president, Mr. G. Harland Bowden, and the president-elect, Mr. W. A. Shaw, which were awarded musical honours. In reply, Mr. Bowden referred to the work accomplished during his two years' term of office, and tendered a hearty welcome to his successor. Regarding the friendly relations between the C.M.A. and E.C.A., he explained that the recalcitrant contractors, when urged to carry out the compact, retorted that one firm of cable makers took contracts for wiring ; he was glad to say that that difficulty had now been definitely removed. He protested against the action of the Municipal Electrical Association, maintaining that the contractor was the best friend of the municipal electrical engineer, if he only got hold of him in the right way, and the best canvasser for the central station. He still hoped that an amicable agreement would be reached, and regretted the waste of time and money in useless fighting. The Scottish branch of the E.C.A. had amicably separated from the latter, because the cost of attending meetings in London swallowed up the receipts ; the arrangement was made for the sake of economy and efficiency, but the defence fund was still available for all parties.

Mr. Shaw also briefly responded, remarking that he had served his apprenticeship in connection with the northern branch, and had been fortunate in securing the goodwill of all his colleagues.

An excellent entertainment was provided, and the function was in every way successful.

The Kearney High-Speed Railway.—On Wednesday, the 12th inst., a luncheon was given at The London Lounge, Oxford Street, to a number of Press representatives by the directors of the Kearney High Speed Railway Co., Ltd. Sir George Reid had promised to be present, but was unavoidably prevented from doing so. A model showing the proposals embodied in the system was shown in operation, and a small car attained on the level as high a speed as 30 miles per hour. The Kearney system is of the so-called "monorail" type, that is, the cars run between two rails one above and one below the car. This is stated to allow of much higher maximum speeds than is permissible with the ordinary double rail track. Every advantage is taken of gravitation, and the proposal in regard to tube railways is to place the stations at or near ground level, and grade the line according to the distance between the stations. Some time ago there was a proposal to construct a line on this principle between the Strand and the Crystal Palace, and at the time we gave our opinion on the prospects of the venture.

It is now stated that a concession has been obtained for a line 11 miles long (2 miles underground and 9 miles in the open) between Nice and Monte Carlo. It is claimed that the saving in first cost of the Kearney over ordinary standard construction is 60 per cent., and that the Kearney trains will accomplish the journey between the termini in 20 minutes, as compared with 35 minutes on the present steam railway expresses. Mr. Graham White, speaking at the luncheon, spoke of the favourable impression an exhibition of the system at the Crystal Palace gave him, and wished the inventor every success in introducing his system.

Mr. Kearney stated that it was hoped that work on the new line would be commenced in the autumn, and that the first section would be opened for traffic before the end of 1913.

A number of claims are made in regard to this system, which, in our view, can only be substantiated by practical working, and until actual results are obtained, we still hold to our doubts as to the merits of the system.

Annual Outings.—On Saturday, June 8th, some 450 members of the works employés and staff of Messrs. Bruce Peebles and Co., Ltd., left Edinburgh in the morning, in excellent weather, for their annual outing, travelling by special train to the ancient town of Stirling. The usual sports were entered into with great gusto, the prizes being presented by Mr. C. J. Hunt, chief of the contract department. After lunch the party split up into groups and various places in the surrounding district were visited by motor car, char-à-banc, or other conveyance. A most enjoyable day was spent.

The employés of Messrs. E. Brook, Ltd., of Huddersfield, held their eighth annual picnic on Saturday, June 15th. Two motor chars-à-bancs left Colne Road at 8 o'clock and arrived at the Leeds showrooms at 9 a.m. After half an hour had been spent in inspecting the Leeds branch, the party left for Harrogate. Dinner, to which 46 sat down, was served at the Somerset Hotel. After dinner Mr. E. Brook, Mr. G. V. Laycock, and Mr. W. Horsfall made a few remarks respecting the very good feeling that existed amongst all connected with the firm, and a wish was expressed that four cars might be required next year. Knaresborough, Otley and Bradford were visited, tea being served at the White Swan Hotel, Otley.

Railway Electrification.—A discussion has been proceeding for some time in the *Engineering Supplement* of the *Times*, as to the relative merits of the single-phase and direct-current systems for railway operation. The following letter in a recent issue, signed "Railway Engineer," admirably sums up the position :—

"I have read with great interest the various articles and letters which have appeared from time to time in the *Engineering Supplement* on the question of railway electrification, but as a railway engineer I find it difficult to discover anything very convincing.

"The question whether one system is a few per cent. more efficient than the other is not the deciding factor; both are remarkably efficient, and the reasonable amount of carelessness in handling which is always present and costs too much to eliminate is more than sufficient to hide any difference.

"Railway electrification, if taken up at all, must be treated on broad lines, and all must realise that the problems of the London Underground are not the problems of any of our large railways. We must realise that a contest with a local tramway is not the end of all things, but that electricity can, and will, replace steam entirely both for passenger and goods traffic. The natural consequence of this will be the electric locomotive instead of the motor-coach.

"The real problem then becomes not one of 5 per cent. more efficiency on the motor, but can we install a third and fourth rail in goods yards, shunting yards, terminal stations, or on any complicated special work, in such a way that an electric locomotive can work over it? It is absolutely impossible. The Central London, using locomotives, had to change to overhead at Shepherd's Bush yard. The North-Eastern using motor coaches revert to overhead in their yards; so also do the American companies.

"Would any Board of Trade accept a third and fourth rail construction in even the wayside goods yards, to say nothing of Camden Town, Crewe, Bricklayers' Arms, Waterloo Station, &c., places open to carters, merchants' clerks, and others with no knowledge of the dangers of contact with such things? Some people are talking of inverted third rail at a higher pressure. Can any one imagine the fate of platelayers in Crewe yard or between Waterloo and Clapham Junction with a high-tension fence between each track? I venture to think we should hear more about working in abnormal places than would be good for us.

"Would the various collieries and engineering works with sidings care to have third and fourth rails on their property, and would insurance companies accept the risk? The third and fourth rail is impossible in all these places, which all occur in thickly populated or suburban areas—the Mecca of the D.C. system. On the open line and for long distances, clear of junctions, special work, and goods sidings, both systems can be installed cheaply and efficiently, but under these conditions the D.C. advocates say the single-phase system is the best and even go so far as to propose a dual system.

"Therefore the question the railway manager has to settle is whether he will install a system on which he can use an electric locomotive or not; a system which can handle only passenger traffic and new rolling stock, or one that can deal with both passenger and mineral traffic with the old stock; a system which he can put into his goods yard with safety to the public and his own employés. The answer is a foregone conclusion. The overhead is the only thing possible. Efficiency has nothing to do with the matter of system; maintenance of permanent way alone is sufficient to decide the question. The battle of efficiency must be fought between high-tension D.C. at 4,000 volts, and that only a laboratory experiment, and single-phase at 10,000 volts, a practical system in operation in almost every country; a motor with 4,000 volts on its commutator and only rendered possible by using a patent magnetic blow-out on the control gear, or a motor with 300 volts A.C. on its commutator and any standard control gear.

"Let railway engineers and managers decide the question from the facts in their own offices; their traffic and permanent way officials are far more capable of saying what can or cannot be done on a railway than any electro-mathematical expert."

An International Tramway Congress.—An important congress of the International Union of Tramways and Light Railways is to be held in Christiania, Norway, from July 2nd to the 5th, followed by an excursion to Bergen. Among the questions to be dealt with at the various meetings are, "The Influence of New Modes of Public Service Transport on the Development and Extension of Large Towns," "The Employment of Motor-Coaches on Railways in General and Light Railways in Particular." Herr Hradezky, the manager of the Vienna municipal tramway system, will present a report on "The Organisation of Tramway Services to Deal with Large Crowds of People in Important Towns." M. Bacqueyrisse, of Paris, and Herr Eisig, of Chemnitz, will present reports on "The Employment of Continuous-Current Motors with Commutator Poles for Electric Tramway Work"; Herr Buschbaum, of Berlin, one on "German Precautions with regard to Electrolytical Currents in Tramway Operation"; M. E. d'Hoop, and Herr Otto, Berlin, one on "The Control and Upkeep of Tramway Overhead Conductors and Feeders"; Herr A. Busse, of Berlin, one on "The Undulatory Wear of Tram Rails"; and M. F. de Le Haye, of the Société Nationale de Chemins de Fer Vicinaux, of Brussels, one on "Progress in the Heating and Lighting of Trains on Light Railways."

Institution and Lecture Notes.—ROYAL SOCIETY OF ARTS.—The Council has awarded the Society's Silver Medal to the following and a number of other readers of papers during the Session 1911-12 :—Prof. G. W. Osborn Howe, M.Sc., M.I.E.E., "Recent Progress in Radio-Telegraphy." H. A. Roberts, M.A., "Education in Science as a Preparation for Industrial Work" George Fletcher, "Technical Education in Ireland." E. Kilburn Scott, Assoc. M.Inst.C.E., M.I.E.E., "The Manufacture of Nitrates from the Atmosphere."

THE INSTITUTION OF GAS ENGINEERS.—This Institution at its recent annual meeting, elected Mr. Corbet Woodall as President for the ensuing year, which marks the Jubilee of the Institution.

VERBAND DEUTSCHER ELEKTROTECHNIKER.—At the opening ceremony of the annual meeting of the German Society of Electricians, which took place in Leipzig on June 6th, the Council of the I.E.E. presented a portrait of Faraday, admirably painted by Miss Beatrice Bright, to Dr. Budde, the president of the I.E.C., as a mark of personal esteem. The presentation was made by Dr. Gisbert Kapp, who, with the general secretary of the I.E.C. (Mr. le Maistre), journeyed to Leipzig especially for this purpose. In performing this ceremony, Dr. Kapp said the tasks of the Commission became more and more difficult, not only in respect of purely scientific or technical matters, but also on account of national considerations; when they came to definitions and names of units the difficulties were greatly increased. To deal fairly with such difficult and delicate questions, each Commissioner must not only have mastered the purely scientific side of the subject, but he must also be able to consider it in a broad and unbiased manner. In both directions Dr. Budde had earned the gratitude of his colleagues; his unvarying courtesy in discussion, and his tact, had smoothed the way of the Commission.

Fatalities.—At an inquest held last week into the circumstances attending the death of Harry Gillis, who was killed at the Knoll Drift colliery, the medical evidence showed that death had resulted from asphyxia caused by an electric shock. The further hearing was adjourned.

While John Greenall, electrical engineer, was in the act of boarding a carriage on the Overhead Electrical Railway, at Liverpool, on Wednesday, June 12th, he fell beneath the moving train and sustained injuries which proved fatal almost instantaneously.

A correspondent states that George Hall, 26, an electrical engineer, working at Buchanan's flour mills, Birkenhead, has died at the Central Hospital, Liscard, as the result of an accident. He was at work near a shaft at the mills, when by some means his clothing was caught in the revolving machinery.

John Bell, aged 34, a linesman, of Ravensthorpe, employed by the Yorkshire Electric Traction Co., was climbing a pole carrying electric wires at Cawthorne, near Barnsley, on Tuesday, when his wrist came into contact with a live wire, and he was instantly killed.

Appointments Vacant.—Engineer and manager, for the Corporation electricity undertaking, West Ham (£550); shift engineer, for the electric light department of Southern Nigeria (£300); junior assistant engineers, for the Yorkshire Electric Power Co. (15s.). See our advertisement pages in this issue.

Smoke Nuisance and the Remedy.—At the Blackburn Court, on June 14th, Messrs. Kershaw & Co., Crystal Spring Dye Works, were summoned for causing a black smoke nuisance. For the defence, Mr. Bonney explained that the firm were making arrangements to do away with the nuisance; they proposed to run the works by electricity. A fine of 20s. and costs was inflicted and an order made to abate the nuisance.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. R. H. LEE, charge engineer at the Gillingham Corporation electricity works, was on the 10th inst. presented with a travelling bag and slide rule by the staff and workmen of the above works, on the occasion of his leaving to take up the post of junior engineer at the Fulham electricity works. The presentation was made by Mr. Alec. D. Chalmers, borough electrical engineer. Mr. Lee was previously with the Kent Electric Power Co., and at Tunbridge Wells, and Glossop.

MR. G. B. CHURCHILL, of the Croydon electricity staff, who was married at Swymbridge (Devon) last week to Miss K. Houle, has been presented by his colleagues with a marble clock.

The Wakefield T.C. has appointed MR. H. G. FRASER, of Blackburn, as works superintendent at the electricity works, at £140 per annum.

On Wednesday, 12th inst., at Rotherham Parish Church, MR. A. C. WRAGG, of the Corporation electricity works, Rotherham, was married to Miss Cissie Thompson, of Canklow, near Rotherham. The bride and bridegroom were the recipients of a silver-plated tea service on oak tray, from the employés of the electricity works, the presentation being made by the chief engineer, Mr. E. Cross.

MR. WILLIAM AITKEN, who has been for the past 10 years on the clerical staff of the Leith Corporation Electricity Department, was on 18th inst., presented with a gold albert by the staff and employés, on the occasion of his leaving for Winnipeg, Canada.

Mr. J. Beveridge, chief clerk, made the presentation, and Mr. Aitken suitably replied.

On June 18th MR. GILBERT TURNER, assistant to Mr. W. D. Hunter, managing director and engineer of the Newcastle and District Electric Lighting Co., Ltd., was married to Miss Katherine Annie Laws. The officials and workmen of the company presented him with a canteen of cutlery.

Tramway Officials.—At the meeting of the Southport T.C. the minute printed in this column in our last issue was discussed. Mr. O'Regan moved that the minute be deleted. He remarked that there was dry rot in the supervision and organisation of the tramway and electricity estates, and the T.C. should go fully into the matter. Mr. Hadfield seconded, and the amendment was defeated. Then Mr. Trounson moved that the consideration of the abolition of the office of deputy tramway manager and electrical engineer be deferred till the Council has received reports of experts to be appointed. This resolution ended in a tie, but the Mayor gave his casting vote for it, and it was carried.

On June 14th, MR. W. JENSEN, general manager of the Chatham and District Light Railways Co., was presented by the employés with a silver-mounted umbrella and a fountain pen, in appreciation of the good feeling existing between them. Not only were the company able to keep a full service going during the whole of the coal strike, but they were able to extend to the men the privilege of having coal at the company's cost price.

General.—In the list of birthday honours announced a few days ago the following, of more or less electrical interest, appear:—MR. H. L. TANGYE, M.I.M.E., F.R.G.S., eldest son of the late Sir Richard Tangye, and deputy-chairman of Tangyes, Ltd., has a baronetcy conferred upon him. The new knights include MR. R. SOTHERN HOLLAND, H.M. Trade Commissioner in South Africa; MR. C. A. KING, C.B., Comptroller and Accountant-General of the G.P.O., and MR. W. B. PEAT, of the well-known firm of chartered accountants. The honour of C.B. has been given to MR. R. A. S. REDMAYNE, Chief Inspector of Mines. The Indian honours include a K.C.I.E. for MR. H. A. KIRK, C.I.E., India Office, Director-in-Chief, Indo-European Telegraph Department, and a C.I.E. for MR. S. K. L. YEATS, Accountant General, Posts and Telegraphs, and for MR. A. CHATTERTON, B.Sc., A.C.G.I., A.M.I.C.E., M.I.M.E., Indian Educational Service, Superintendent of Industrial Education, Madras. MR. H. M. ROBINSON, Deputy Chief Inspector of Factories at home becomes a Companion of the Imperial Service Order, as does also MR. DONALD ROBERTSON, Secretary, P.O. and Telegraph Department, Dominion of New Zealand, and MR. C. J. DEASE, Superintendent of Post Offices, N.W. Frontier Province, India.

According to the *Standard*, the L.C.C. at Tuesday's meeting received, with regret, the resignation of SIR MAURICE FITZMAURICE, C.M.G., its chief engineer, who is about to commence private practice.

MR. V. D. GREEN, late with Messrs. S. Jevons, Ltd., of Birmingham, has now accepted the management of the Pontelec Welding Patents, Ltd., of Birmingham.

The marriage took place recently, in Bath, of MR. C. G. LAWSON, an electrical engineer at the General Post Office, London. Among the presents was an inlaid mahogany clock from his colleagues.

MR. C. H. JESSOP has rejoined the Langdon-Davies Motor Co. as their outdoor representative.

MR. LEONARD A. LEVY, M.A. (Cantab), B.Sc. (London), F.I.C., &c., who has charge of the chemistry department of Messrs. Alex. Wright & Co., Ltd., has just been awarded by the University of London the degree of Doctor of Science. Dr. Leonard A. Levy will continue to take charge of Messrs. Wright's chemistry and research department.

MR. S. D. BARNWELL, electrical engineer, Alcasiza Seccion of the Buenos Ayres and Pacific Railway Co., Argentina, who is on a short visit to this country, will be obliged if manufacturers of dynamos, motors, and electrical accessories will send their catalogues to him at Saint Martin's, Beckenham.

NEW COMPANIES REGISTERED.

Tomellin Syndicate, Ltd. (122,392).—This company was registered on June 4th, with a capital of £5,500 in 5,000 preference shares of £1 each, and 10,000 deferred shares of 1s., to acquire the benefit and undertake the liabilities of R. T. Cottrell under an agreement between himself and E. W. Crane, to acquire all or part of the shares of the Compania Hidro-Electrica de Oaxaca, S.A. (incorporated in Mexico), to acquire a concession granted by the Federal Government of Mexico for the utilisation of the waters of the Rio Grande in the State of Oaxaca for the production of electrical energy, to acquire all or part of the undertaking and assets of the Oaxaca Power and Light Co., &c. The subscribers (with one preference share each) are:—F. J. Abbott, 28, Inderwick Road, Hornsey, N., cashier; F. J. White, Rox-Leigh, Ingrave Road, Brentwood, managing clerk. Private company. The number of directors is not to be less than two or more than four; the first are R. F. Cottrell and F. Deverell; qualification, 25 shares; remuneration (except managing director, if any), £150 per annum. Registered by Surtees, Phillpotts and Co., 6, St. Helen's Place, E.C.

Finch & Wheeler, Ltd. (112,458).—This company was registered on June 7th, with a capital of £3,000 in £1 shares (2,000 6 per cent. preference), to carry on the business of electrical engineers, electricians, &c., and to adopt an agreement with A. E. Finch and F. H. Wheeler. The subscribers are:—A. E. Finch, 6, Carolin Place, W.C., gentleman, 1,000 preference shares; F. H. Wheeler, 17, Eatonville Road, Upper Tooting, S.W., gentleman, 1 ordinary share. Private company. The number of directors is not to be less than two or more than five; the first are A. E. Finch and F. H. Wheeler; qualification, £100; remuneration of first directors £250 each per annum. Registered office, 9, Old Queen Street, Westminster, S.W.

Super Heat Furnace Co., Ltd. (122,468).—This company was registered on June 7th, with a capital of £1,000 in £1 shares, to carry on the business of electrical and mechanical engineers, founders, smiths, machinists, patentees and manufacturers. The subscribers (with one share each) are:—R. F. Holt, 15, Masham Place, Toller Lane, Bradford, clerk; G. L. Waddington, 11, Hampton Place, Bradford, clerk. Private company. The number of directors is not to be less than two or more than seven; the subscribers are to appoint the first. Registered by Jordan & Sons, Ltd., 116-117, Chancery Lane, W.C.

Scientific Treatments, Ltd. (8,280).—This company was registered in Edinburgh on May 30th, with a capital of £5,000 in £1 shares, to acquire the business of Power Appliances Co., 81, West Regent Street, Glasgow, and to carry on business as electrical and general engineers. The subscribers (with one share each) are:—H. A. Thomson, 22, India Street, Glasgow, electrical engineer; T. Brown, 55, Pitt Street, Glasgow, merchant; J. Campbell, 94, Wellington Street, Glasgow, merchant; J. Craig, 498, Sauchiehall Street, Glasgow, cabinet maker; J. M. Symington, 39, Albert Road, East Crosshill, Glasgow, plumber. Private company. The number of directors is not to be less than three or more than seven; the first are H. A. Thomson, T. Brown, J. Campbell, J. Craig and J. M. Symington; qualification, 100 shares. Registered office, 22, India Street, Glasgow.

S. W. Martyn & Co., Ltd. (122,388).—This company was registered on June 4th with a capital of £10,000 in 9,500 preference shares of £1 each and 10,000 ordinary shares of 1s. each, to take over the business carried on at 11, Pratt Street, Camden Town, N.W., as "S. W. Martyn & Co.," and to carry on the business of automobile, mechanical, electrical, hydraulic and general engineers, &c. The subscribers (with one preference share each) are:—L. Hamilton, 100, King's Road, Camden Road, N.W., typist; S. W. Martyn, 11, Pratt Street, Camden Town, N.W., electrical engineer. Private company. The first directors are S. W. Martyn (managing director) and two others, to be appointed by him; qualification, £250. Registered by C. Doubble, 14, Serjeants' Inn, E.C.

Fred Danks, Ltd. (122,376).—This company was registered on June 4th, with a capital of £30,000 in £1 shares, to carry on the business of makers of boilers, tanks, superheaters, economisers and other boiler accessories, repairers of boilers, engine builders, motor engineers, motor-car and wagon builders, makers of electric motors, dynamos and electric machines and apparatus, &c. The subscribers (with one share each) are:—F. T. Danks, Glengarth, Quinton, Birmingham, boiler manufacturer; S. Hollingsworth, Deerwood Grange, Four Oaks, Warwickshire, gentleman; A. R. Baxter, Wellington Road, Edgbaston, Birmingham, gentleman; B. Baxter, Wellington Road, Edgbaston, Birmingham, manager. Private company. The number of directors is not to be less than two or more than five; the first are F. T. Danks, S. Hollingsworth, A. R. Baxter and B. Baxter (all permanent, special qualification, 1,000 ordinary shares); qualification of ordinary directors, £100. Registered by Jordan & Sons, Ltd., 116-7, Chancery Lane, W.C.

No Cell, Ltd. (122,410).—This company was registered on June 5th, with a capital of £3,000 in £1 shares, to acquire from H. C. H. Smyth, of 4, Barley Mow Passage, Chiswick, the benefit of certain existing inventions relating to an improved magneto-electric machine and the existing patent relating thereto, and to adopt an agreement with C. C. Hurford, H. C. H. Smyth, H. Goldney, H. J. de Barry Barnett and G. Adams. The subscribers (with one share each) are:—C. Hurford, 48, Dover Street, W., automobile engineer; H. C. H. Smyth, 4, Barley Mow Passage, Chiswick, electrical engineer; H. Goldney, 10, Durham Road, Sheffield, engineer; H. J. de B. Barnett, 48, Dover Street, W., automobile engineer; G. Adams, 48, Dover Street, W., automobile engineer. Private company. The first directors are C. Hurford, H. C. H. Smyth, H. Goldney, H. J. de B. Barnett and G. Adams; qualification, 100 shares. Registered office, 12, Dover Yard, Dover Street, W.

Louis F. Light Syndicate, Ltd. (122,429).—This company was registered on June 6th, with a capital of £12,000 in £1 shares, to carry on the business of manufacturers of and dealers in searchlights, lamps, generators, transmitters, receivers and holders of any gas, fluid or substance for the production of light, electricians, &c., and to adopt an agreement with W. S. Searle and L. Girodo. The subscribers (with one share each) are:—J. R. Crellin, 74, Empress Avenue, Ilford, manager; A. J. H. Angier, 84, Stanley Road, Ilford, stenographer. Private company. The number of directors is not to be less than two or more than seven; the first are W. S. Searle and any nominee (if any) of the Automobile and Petrol Syndicate, Ltd. (who may nominate a director while holding 1,000 shares), and others to be appointed by the subscribers; W. S. Searle may retain office while holding 1,000 shares; qualification, one share. Registered office, 20, Copthall Avenue, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Mirfield Garage and Electric Works, Ltd. (119,654).—Mortgage dated May 1st, 1912, to secure £450, charged on freehold land, motor garage and electric works at Easthorpe, Mirfield, Yorks. Holders: Rev. B. Wilson; and E. B. Wilson, Mirfield.

Peto & Radford, Ltd. (79,761).—Return dated April 30th, filed May 1st, 1912. Capital £40,000 in £1 shares. 34,000 shares taken up. £4,850 paid. £29,150 considered as paid. Mortgages and charges: Nil.

Metalite, Ltd. (110,919).—Particulars of £25,000 second debentures, created March 22nd, and secured by trust deed dated April 12th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the whole amount being now issued. Property charged: Land at Osmaston, Derby (subject to prior charges), and company's other assets, except uncalled capital. Trustees: W. Jaggard and R. C. J. Goodrich.

Hong Kong Tramway Co., Ltd. (75,486).—A memorandum of satisfaction to the extent of £800 on March 29th, 1912, and to the extent of £2,200 on April 12th, 1912, of mortgage dated July 1st, 1908, securing £195,000, has been filed.

M. E. Robinson & Co., Ltd. (121,625).—Mortgage on leasehold land with buildings thereon in Grey Street and Wharf Street, Openshaw, Lancs., dated May 8th, 1912, to secure all moneys due, or to become due, from company to National Provincial Bank of England, Ltd., 15, Bishopsgate, E.C.

Sheerness and District Electric Power and Traction Co., Ltd. (65,749).—Issue on May 16th, 1912, of £3,400 debentures, part of a series of which particulars have already been filed.

Campbell & Isherwood, Ltd. (97,971).—A memorandum of satisfaction in full on June 3rd, 1912, of debentures dated June 17th, 1908, securing £400, has been filed.

Novelty Construction Co., Ltd.—(Debenture, dated May 31st, 1912, to secure £915, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital. Holder, J. S. Hecht, Sphere Engineering Works, St. Albans.

Acton Lamp Co., Ltd. (110,486).—Issue on May 22nd, 1912, of £400 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Aluminium Corporation, Ltd.

In their report for the 12 months ending December 31st, 1911, the directors say that the period covered by the accounts was one of unexampled depression in the price of metal. The loss shown on the year's working is due to circumstances which could not have been anticipated. [It appears from the balance-sheet that the loss on trading account was £1,786.—Editors.] There appears to be every prospect of the present improved market price of aluminium being maintained, and the directors look forward with confidence to the company's future. On completion of the Eigiau Dam in March, 1911, it was found necessary to empty the Lake and render the inside of the walls with concrete. This extra work was not completed until August last, and active operations could not be resumed until the Lake refilled in November, 1911. It will thus be seen that the company practically had only two full working months in the whole year. Serious difficulties have also been experienced with the plant installed by the old company at the Wallsend Carbon Works, and after much consideration it was decided to remove these works to Dolgarrog. The directors report that the chairman of the company has agreed to advance upon second mortgage a sum sufficient to enable this programme to be completed, and further economies should result therefrom. The works have been maintained in a high state of efficiency out of revenue, and it has not been deemed necessary, in the present accounts, to make any provision for depreciation. In order to comply with certain conditions of the scheme of reconstruction, an extraordinary general meeting has been convened, and will be held immediately after the close of the annual meeting (June 24th, at Salisbury House, E.C.), for the purpose of passing the necessary formal resolution to enable the balance of the preference shares (750 fully paid) to be converted into preference stock.

Messrs. E. Manville, W. C. Stennett and A. W. Wylie have retired from the board, and it is not proposed at the moment to fill the vacancies caused thereby. The remaining directors are: K. M. Clark, S. G. Bibby, R. Lawson and G. T. Moody.

Prospectus.—*The Letters Patent Insurance Co., Ltd.*—The subscription list of this company will close on Monday next for town, and on Thursday next for country and abroad. An abstract of the prospectus will be found in our advertisement pages to-day. It offers 125,000 6 per cent. cumulative part preference shares of £1 each, 2,000 6 per cent. ditto of £50 each, and 225,000 ordinary shares of £1 each, all at par. Subscribers for preference shares will be entitled to apply for one ordinary share per £1 share value taken up. The company has been formed to undertake insurances to cover the liability of patentees and others, so far as the law allows, of the costs and expenses of prosecuting and defending actions in connection with letters patent, designs, trade marks, and other monopolies, including any damages awarded against defendants in such actions. It is intended to issue policies not only to patentees but also to licensees. In addition to the directorate, there is a strong advisory council of experts, including Mr. Frank Bailey, Mr. James Swinburne, and Prof. W. C. Unwin. Provisional offers have been made by Lloyd's Underwriters to re-insure a large proportion of the risks.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.—The half-yearly meeting is called for June 25th, at 11.30 a.m., at 106, Cannon Street, E.C., and sanction will then be asked to the payment on July 1st of the half-yearly preference dividend of 5s. per share, less income-tax, due July 1st, at the rate of 5 per cent. per annum. The board announce that they have decided not to pay on this occasion an interim dividend on the ordinary shares. The circular reads: "It is in the opinion of the board, impossible at this period to estimate with any exactitude what profits will be earned at the end of the financial year. The recent coal strike has thrown a considerable additional expense on the company, and the present disturbance in the labour market is causing anxiety. Under these circumstances, the board feel that it is advisable in the interest of the business to adopt a conservative attitude."

Hankow Power and Light Co., Ltd.—The annual meeting of the above company was held on Tuesday at the offices, 21, Ironmonger Lane, Cheapside. A representative of the Electrical Review was informed that the proceedings were private, and a request for a copy of the annual report was refused.

Sunderland District Tramways, Ltd.—Meetings of the prior lien bond and debenture-holders, also of persons, firms and others entitled to the benefit of a charge dated December 14th, 1906, have been called for June 25th, under direction of the Court, to consider a proposed scheme of arrangement between the company and the foregoing.

Barnsley and District Electric Tramways Co., Ltd.—The directors have declared a dividend of 2 per cent. on the ordinary shares. The revenue was £9,900 (an increase of £159), and the expenses £7,422, the divisible balance being £2,596.

Vulcan Boiler and General Insurance Co., Ltd.—The directors have declared an interim dividend of 4s 6d. per share.

Provincial Tramways Co., Ltd.—An interim dividend of 8d. per share (less income-tax) on the ordinary shares for the half-year, is announced

Globe Telegraph and Trust Co., Ltd.—The directors report that the net revenue for the year, after deduction of expenses, amounts to £210,472 and makes, with £28,532 brought forward, £239,005. From this amount there has been distributed the sum of £131,085 in interim dividends, leaving an available balance of £107,919. The directors now recommend the payment of the following final dividends, viz.: 3s. per share, less income-tax, on the preference shares, making, with previous distributions, a total dividend for the year on those shares at the rate of 6 per cent. per annum, less income-tax; and 6s. per share net on the ordinary shares, making, with previous distributions, a dividend on these shares at the rate of 6 per cent. net for the year. These dividends will absorb £79,922 and leave a balance of £27,997 to be carried forward. During the year 1,000 shares of £10 each in the Direct United States Cable Co. have been sold; and the proceeds have been invested in shares of the Mackay Companies, and the Telegraph Construction and Maintenance Co., Ltd. The Right Hon. Viscount Middleton has been appointed a director to fill the vacancy created by the death of the Marquis of Tweeddale.

Yorkshire (West Riding) Electric Tramways Co., Ltd.—The directors have declared, out of the profits for the half-year ending 30th inst., an interim dividend at the rate of 3 per cent. per annum (less income-tax) on the 6 per cent. cumulative preference shares.

Direct United States Cable Co., Ltd.—The directors have issued the accounts for the nine months ended March 31st, 1912, at which date it has been decided to close the company's financial year to coincide with the lease of the cables to the Western Union Telegraph Co., which has been duly completed, and is for 99 years from April 1st, 1911. The accounts differ in form from those that have hitherto been published, as they cover the period during which the lease above referred to has first become operative. It will be observed that after payment of a dividend at the rate of 4 per cent. per annum, and a bonus at the rate of 1 per cent. per annum for the nine months to March 31st, 1912, a surplus of revenue remains of £7,400, which has been credited to the reserve fund account. The reserve fund account shows a balance of £509,128, as compared with £512,323 at June 30th, 1911, a decrease of £3,195, which is accounted for by expenses in connection with the lease above referred to. During the nine months covered by the accounts, the expenses of maintaining the cables were normal, but the directors regret to state that the main cable has been interrupted in deep water in mid-Atlantic. The cable ship *Faraday* left London at the latter end of May for the position, and is now engaged upon the repair thereof. The main cable was also recently crushed off the Newfoundland shore through an iceberg settling upon it, but it has now been repaired.

Stock Exchange Notices.—Applications have been made to the Committee to appoint a special settling day in and to grant a quotation to—

Alabama Traction, Light and Power Co., Ltd.—Scrip, fully and partly paid for $6,000,000 5 per cent. first mortgage 50-year gold bonds.

New York Telephone Co.—Scrip, fully and partly paid, for a further issue of £1,750,000 4½ per cent. first and general mortgage 30-year bonds (London issue).

To appoint a special settling day in:—

River Plate Electricity Co., Ltd.—Further issue of 30,000 ordinary shares of £1 each (issued at £1 per share premium), 5s. capital paid (Nos. 119,994 to 120,500 and 120,508 to 150,000).

And to allow the following securities to be quoted in the Official List:—

Marconi's Wireless Telegraph Co., Ltd.—Further issue of 250,000 ordinary shares of £1 each, fully paid (Nos. 750,001 to 1,000,000). (Renewed application.)

The Committee have ordered the undermentioned securities to be quoted in the Official List:—

Cuban Telephone Co.—£155,000 additional 5 per cent. first mortgage convertible bonds (Nos. 8,914 to 10,000 and 10,601 to 12,018 of £100, and 13,687 to 13,886 of £20 each).

United Electric Tramways of Monte Video, Ltd.—£100,000 additional 5 per cent. first debenture stock.

J. G. White & Co., Ltd.—The report states that the results of the business show a net profit on the year's trading to February 29th of £87,106. According to the *Financier*, the return of interest and dividends on investments during the year was equal to 6·5 per cent. on the amount of the valuation. A further £25,000 is allocated out of profits to the special dividend equalisation reserve, making this reserve now £40,000. The directors recommend a dividend of 12 per cent. per annum on both classes of shares, and, in addition, an extra dividend of 10s. per share on the ordinary shares. The balance to the credit of profit and loss, after bringing in £19,812 from the previous account, deducting the interim dividend paid on the preferred and ordinary shares at January 1st, 1912, and making provision for percentages due to directors and staff, is £83,212. This sum the directors recommend should be dealt with in the following manner: Dividend of 6 per cent., less income-tax, on cumulative preferred shares for the half-year to February 29th (making 12 per cent. for the year), £9,000; in payment of a dividend of 6 per cent., less income-tax, on the ordinary shares for the half-year to February 29th (making 12 per cent. for the year), £3,000; in payment of an extra dividend of 10s. per share, less income-tax, on the ordinary share capital for the year, £25,000; to special reserve for equalisation of dividends, £25,000; leaving to be carried forward £21,211

The B.E.T. Report.

A PERUSAL of the report and accounts of the British Electric Traction Co., Ltd., for the financial year ended March 31st last is unlikely to afford much encouragement to the stockholders ranking after those comprising the cumulative preference category, though there are indications of improvement.

According to the report, the "gross profit" for the year was £195,040, but at its best the phrase gross profit is from a practical point of view more or less useless. Here its use is incorrect and misleading. Let us arrive with as little preamble as possible at the real profit or result of the revenue operations of the year. The sum mentioned merely represents the total amount standing at the credit of the revenue account for the period, and is composed of dividends and interest on investments, £169,092; net profit on working of undertakings, £7,958; interest on loans and deposits, £3,218; and sundry profits and fees, £14,771. In previous years the revenue from dividends on shares, interest on debentures, and interest on consols, has been shown separately; but for some reason which requires explanation, these items are this year shown in one sum under the title of dividends and interest on investments, which collectively shows a substantial improvement, as also does the result of the working of the undertakings when compared with the previous year's figures. On the other hand, sundry interest on loans and deposits show a decrease of over £8,000, whilst sundry profits and fees are about £1,200 better at £14,771. We should advise the company to revert to the practice of showing separately the revenue from the different sources indicated, and in future to give some reasonable detail of the composition of sundry profits and fees.

£19,063 is debited against revenue in respect of management and general expenses, income-tax and contributions to superannuation fund, whilst debenture interest absorbs £92,799. £23,292 has been written off expenditure on surveys and negotiations, stock and office furniture, so that the profit for the year is about £59,885, as against some £46,000 for the previous year. Adding to that sum £10,831 brought forward from the previous year, we have a credit balance of £70,717, of which there is reserved for—

Investments and undertakings	£25,000
Debtors	7,500
Undertakings worked by the company ...	3,000
Buildings	250
	£35,750

The satisfaction of the cumulative preference dividend claims £24,215, so that there is a resulting credit balance of £10,751, which is carried forward, the stock-holders coming after the cumulative preference holders deriving but cold comfort.

The investments stand in the balance-sheet at £5,178,440; but there does not appear to be any record as to whether this represents cost or otherwise. The expenditure on the undertakings at Brighton and Shoreham, Barrow and Mumbles, worked by the company, appear less, £21,500 for reserve, at £140,395, which with the investment book values totals £5,318,835. For the first time the net accumulated reserve (little of which relatively appears to be the product of allocation from profit and loss account) which, according to the previous report, stood at £666,321, and which was previously shown on the liabilities side of the balance-sheet, is now exhibited as in reduction of the £5,318,835 to which we have made allusion.

The reserve, however, has suffered some serious fluctuations during the period represented by the accounts. As we have stated, it had swollen to £666,331 at the last account, and it was augmented at March 31st, 1912, by an appropriation from revenue of £25,000. It has been further increased by £2,831, being profit on sale of investments, and by £1,323 being difference between nominal amount and purchase price of debenture stocks purchased during the year and cancelled, the additions bringing it up to £695,487; but in the meantime it has been adversely affected by a reduction of £71,754, £11,118 being due to loss on sale of consols; investments written down by reason of reductions of capital accounting for £59,805—£36,671 of which is attributed to the Brush Co.; £706, representing cost of participations in syndicates, having been written off; and sundry adjustments amounting to £124, so that the total reserve at the end of the year, which is now shown in reduction of investments and undertakings, is £623,732.

Investments standing at £3,659,861 were revenue-earning during the period, but others representing £1,518,579 did not yield any return in respect of the financial year.

There are uncalled liabilities on the investments amounting to £132,568, which sum is shown as a footnote to Schedule I; but this should also have appeared on the face of the balance-sheet indented, as we have pointed out on several previous occasions.

Buildings and freehold land—Electrical Federation Offices, Kingsway—less a reserve of £4,250, are stated at £43,246, and there is nothing of particular moment until we arrive at sundry debtors and debit balances, which figure, less a reserve of £43,240 at £216,443, against £247,997 at March 31st, 1911. This indebtedness is very large, and if any portion of it is in respect of dividends and interest due by the Associated Companies to the B.E.T., such portion should be separately shown—otherwise it would appear to require drastic treatment. During the year the Brush Co. would seem to have increased its debt to the company by about £17,000, as compared with the record for 1910-11. There are no indications in Schedule V of the nature of the indebtedness in each case, which seriously discounts, for all practical purposes, the value of the schedule. Before leaving the credit side of the balance-sheet, we may refer to an item of stock of cars, equipments, and general stores, which appeared in the balance-sheet as at March 31st, 1911, at £15,623, less a reserve of £7,000, net £8,623. There is no item of stocks of cars, &c., in the balance-sheet under review; but there has been written off the stock account the sum of £1,549. The accounts might have shown what this stock realised, and whether the amount of £7,000 previously reserved is wholly, or if only partially to what extent, an actual loss to the company, or whether the realisation of the asset has resulted in a profit.

For the first time we have the issued capital of the company shown in the new form in accordance with the agreed rearrangement, totalling £2,947,380. The debenture debt is still heavy, at an amount exceeding 1¾ millions, and we should urge upon the company the desirability of reducing this loan debt substantially during the next few years, which, doubtless, would have the effect of improving the position and prospects of the capital stockholders.

Sundry creditors and credit balances stand at the large sum of £62,757, as against £13,267 at March 31st, 1911, which necessitates some explanation, the interest on the debenture stocks accrued to date, which is, of course, a liability, and which is shown at £44,566, calling for no particular observation.

The £266,371 non-interest bearing income certificates (which are redeemable out of profits only) are shown properly on the face of the balance-sheet, indented; but as to when they are likely to be liquidated would appear to be somewhat remote.

A critical review of the accounts only serves to confirm a previously expressed view that the remedy for the position of the B.E.T. does not consist of a rearrangement of capital, such as that to which assent and effect have been given, but in a drastic reduction.

That the Associated Companies have made progress during the year is obvious, inasmuch as the dividend and interest received by the B.E.T. are greater by about £35,000, whilst the receipts of these companies, as compared with 1910, show an improvement.

As we have previously pointed out, some of the schedules accompanying the report and accounts require considerable amplification before they can be of service to stockholders and investors.

For instance, take Schedule I of Investments and Undertakings, we have merely the name of the undertaking, nominal amount held by the B.E.T. Co., and the amount at which the securities stand in the books of the company. There does not appear to be anything showing whether and how much of the investment consists of ordinary or preference shares, debentures or debenture stock, whether at cost, or what. The statement requires considerable dissection to render it of practical service and interest. Again, Schedule IV, which shows the "amounts set aside by Associated Companies for depreciation and other reserve funds including balance of profit carried forward" is of little value; the balances of profit carried forward should be distinctly exhibited.

Edmundson's Electricity Corporation, Ltd.

THE directors have submitted to the shareholders a scheme for adjusting the capital account, so as to enable them to resume the payment of dividends on the preference shares. The scheme has been submitted to, and approved by, some of the largest holders of preference and ordinary shares.

A circular issued under date June 14th explains the proposals briefly as follows:—

"1. To reduce the paid up capital by £160,000 by writing £2 per share off the 80,000 ordinary shares of £5 each.

"2. To split the existing 80,000 6 per cent. cumulative preference shares of £5 each into 40,000 6 per cent. cumulative preference shares of £5 each and 40,000 6 per cent. cumulative preference shares of £5 each and 40,000 6 per cent. non-cumulative preference shares of £5 each, the cumulative preference shares to rank for dividend ahead of the non-cumulative preference shares until the latter have received their full 6 per cent. dividend for two successive years, when the non-cumulative dividend will become cumulative, and both classes of shares will rank *pari passu*, and be consolidated into a single class as at present.

"3. To attach to both classes of preference shares the right to participate in further profits with the ordinary shares to the extent of ½ per cent. for every 1 per cent. paid on the ordinary shares, up to a maximum of 7 per cent. inclusive of the fixed 6 per cent. dividend.

"4. To cancel the arrears of cumulative preferential dividends, amounting at March 31st last to £132,000.

"The directors have made a valuation of the assets of the company as shown in the last published accounts, and assuming the company's unsecured investments in the various subsidiary companies require to yield a return of 5 per cent. in order to justify a par value being placed on them, they find that on the basis of the revenue for the past year these investments show a deficiency in capital value of over £700,000; or, in other words, that is the amount of capital yielding no return for the year 1911-12. It is not suggested that the whole of this capital is lost, but after allowing for appreciation in capital value to the extent of £200,000 as the result of further progress, there is still a deficiency of over £500,000, and the existing reserves, the profit balance for the past year, and the £160,000 by which it is proposed to write down the ordinary share capital, approximately make up this figure. The directors believe that the majority of the shareholders will prefer to deal with the above situation by reducing the ordinary share capital by £2 per share, which they are satisfied is sufficient to fully provide for permanent loss of capital, rather than to adopt the alternative course of indefinitely postponing the payment of dividends. In the opinion of the directors, the loss of capital should be entirely borne by the ordinary shareholders, but having regard to its magnitude, and to the fact that it is equally, and indeed primarily, in the interests of the preference shareholders

that the present unsatisfactory position should be adjusted, they feel that the latter may fairly be asked to contribute to the solution of the difficulty by foregoing their arrears of cumulative preferential dividends and part of their future cumulative preferential rights in consideration of the participating rights which it is proposed to concede to them.

"The directors estimate that, after meeting interest and sinking fund on the debenture stocks, the available surplus of profits for the current year will be from £18,000 to £20,000, but with some £10,000 to £12,000 of the profits in the form of trading profits, derived largely from companies in which this company holds the whole or the greater part of the ordinary share capital, and in part represented by the paper of such companies, the directors feel that they are unlikely to be justified in distributing more than £12,000 in respect of the current year. This will suffice to pay a 6 per cent. dividend on £200,000 of capital, and they, therefore, propose that the existing £400,000 of preference share capital should be split into two amounts of £200,000, one carrying a 6 per cent. cumulative preferential dividend, the other a 6 per cent. preferential dividend temporarily non-cumulative until the full 6 per cent. dividend has been paid on such shares for two years in succession. The directors are advised that this splitting of the existing preference shares will tend slightly to enhance tkeir market value, since the new cumulative preference shares, with the dividend assured, should immediately command a good price. With reference to the participating rights which it is proposed to attach to both classes of preference shares, the directors believe that it is better to give the preference shareholders a further permanent participation in the profits of the company, rather than to attempt to deal with arrears of cumulative preferential dividends by issuing funded dividend certificates. The value of the participating rights may appear somewhat remote at the moment, but any other advantage which it is possible to offer to the preference shareholders as compensation for the sacrifice they are asked to make, must necessarily be equally remote. Under the scheme, the first £24,000 per annum of available profits will go to the preference shareholders, as at present, whilst ultimately they will be entitled to an additional £4,000 per annum. The company's legal advisers recommend that advantage should be taken of the present opportunity to bring the articles of association up to date, and accordingly the accompanying notices of meetings to pass the resolutions necessary to give effect to the above scheme, also embody the resolutions for this purpose. One of the proposed alterations of the articles provides for an increase of the directors' remuneration."

Meetings of the different classes of holders are called for Tuesday next, June 25th.

United Electric Tramways of Monte Video, Ltd.

Mr. G. A. Touche presided at the annual meeting held at Winchester House, E.C., on 14th inst. In moving the adoption of the report (see Elec. Rev., page 976), he said that the year had been one of much activity and some anxiety. Important developments have been carried out, but they had had to contend with unusual difficulties. The strike in Monte Video affected all the tramways in the city, and the coal strike in England affected them because the company got its coal supplies here. They had now provided the remainder of the cost of construction of the line to Maldonado, and the greater part of the cost of the extension of the Colon line. This extension was now practically completed, and should be ready for service shortly. The extension of the Colon line completed the lines which they were required, under their concessions, to construct. They had in view, therefore, some cessation of expenditure, at least for the present, on new lines. But expenditure on permanent way had not come to an end. Like other tramways, they were obliged to pave and maintain the roadway between, and for a certain distance on each side of, the tracks. A good deal of expenditure would still have to be met when streets, at present unpaved, were paved, or when streets already paved were repaved with a more expensive form of paving than was in use at present, such as asphalte in place of cobble or setts. The Municipality of Monte Video were as present contracting for the asphalting of a number of streets occupied by the company's lines. Other immediate expenditure would be on the construction of the new office buildings, and on the provision of the additional 25 cars mentioned in the report. An order for these had recently been placed. They were to be delivered in time for the next summer season. When the 25 additional cars came into service there would be a total of 313 cars and trailers available. The extension of the lines and the increased number of cars in service almost necessarily pointed to an extension of the power plant. It might be necessary to construct sub-stations for the supply of some of the outlying districts. The whole question was now under consideration. The unissued share and debenture capital of the company amounted to £250,000. This should provide for all visible prospective capital requirements. It might be necessary to issue a portion of this unissued capital during the current year. As regards maintenance, in the limits of the old city, where the traffics were heaviest, it was natural that some of the tracks should be showing signs of wear. The first lines were opened in the year 1906. As some of the streets were being repaved by the municipality, they would take the opportunity of relaying the rails where the roadways were opened up. The results for the financial year of La Sociedad Commercial de Monte Video, to October 31st, 1911, were satisfactory in view of the adverse conditions under which they had been obtained. There had been exceptionally bad weather throughout the year, (220 days), including more than half the Sundays and public holidays. They had no summer whatever, while the winter was one of the severest within recollection. The traffic receipts for the year, however, showed an increase. The receipts were £298,553, as compared with £279,990 during the previous year; that was an increase of £18,563, or over 6½ per cent. The loss in traffics during the strike period was about £8,500. The passengers carried during the year numbered 34,662,138, as against 32,474,355, an increase of 2,187,783. The working expenses showed an increase of 1·01 per cent.—56·63 per cent., as compared with 55·62 per cent. The expenses were increased by approximately £5,553, as a result of the increased rates of wages granted by the company and bonuses to loyal employés. Coal cost on an average 4s. 10½d. per ton more than in the previous year. As the coal consumed was 12,661 tons, this increase in price accounted for a further additional charge of £3,086. These increases by themselves, amounting to £8,639, were about 2·89 per cent. of the gross receipts, yet the actual increase in expenses was only 1·01 per cent. This showed that, apart from the special items mentioned, the record of previous years had been maintained. For the first six months of the year (prior to the strike) there was an actual diminution in the ratio of expenses as compared with the previous year. These figures related to a year which was only partially affected by the increase in wages. The current and future years would experience the full extra charge, estimated at nearly £13,000 a year. There was also a proposal to apply to all industries in Uruguay the experiment of a statutory eight hours day, which had resulted so unsatisfactorily to employers and employed alike in the coal-mining industry in this country. If the measure became law it would mean a further increase in working expenses. The traffic receipts for the seven months to the end of May, 1912, showed that expansion had continued, partly owing to the natural growth of traffic and partly to the result of a fine summer. For the six months to the end of April, the receipts were £185,362, as compared with £166,176 to the end of April, 1911, an increase of £19,186. The working expenses for the six months were 52·97 per cent., as compared with 51·17 per cent., an increase of 1·80 per cent. The net receipts for the six months to the end of April were £87,178, as compared with £81,143, an increase of £6,035.

The motion was seconded by Mr. T. Frame Thomson, and carried unanimously.

Bombay Electric Supply and Tramways Co., Ltd.

The directors of this subsidiary of the B.E.T. report that, for the year, 1911, the net receipts show an increase of over 16 per cent., as compared with the previous year, the net profit being £77,861, which, with £11,000 brought forward, makes a disposable balance sufficient to pay the 6 per cent. cumulative preference dividend, 3 per cent. on the ordinary share capital, and to allocate £16,700 to depreciation, £6,531 to the sinking fund for capital redemption, £531 being in lieu of interest on debenture stock cancelled, £5,000 to general reserve, leaving £7,385 to be carried forward to the next account.

We have, on several previous occasions, from the days of its promotion, commented at length upon the accounts of this undertaking. The cost of old horse tramways stands at £115,000, these horse tramways, we presume, not now being in existence. Rights and concessions on power station, &c., electrification and reconstruction, goodwill and preliminary expenditure figure at £1,747,354, including the capitalisation, during the year, of £602 of London administrative expenses, which is no new feature in the accounts of the company. This absurdly grouped item conveys little or no tangible information, and should be dissected and shown in reasonable detail. The cost of underwriting and issuing share capital, &c., appears at £159,070, which, of course, is not an asset, the investments totalling £42,480, at cost, the market value of which, as at December 31st, 1911, is omitted and should have been shown indented in the usual way. These investments include £11,300 of the company's own debentures, and the proprietors might pertinently request the board to explain the object and advantage, if any, in adopting such a course. The debenture debt is exceedingly heavy at a figure exceeding three-quarters of a million, and an increased and drastic rate of extinction seems to be required.

The sinking fund for capital redemption is exhibited at £12,882.

The track rents, which are set down at £3,626 seem to be low, and would appear to be capable of increase.

An academic, though important, point is suggested in the use of the phrases "Capital expenditure and other assets" and "Capital and other liabilities," and would be more correct with the omission of the word "other."

Mexican Light and Power Co., Ltd.

The annual general meeting is to be held at Toronto on July 3rd. The annual report to December, 1911, shows that the net revenue in gold, after paying all expenses and fixed charges, amounted to $1,251,679, which, with $745,848 brought forward, makes a total credit balance to profit and loss account of $1,997,527. Out of this sum the directors have paid during the year dividends of 7 per cent. on the preferred shares, and 4 per cent. on the ordinary shares, absorbing the sum of $963,400, and have placed to reserve account the sum of $50,000, which now stands at $427,884. After these appropriations there remains a balance to the credit of profit and loss account of $984,127, which has been carried forward. None of the company's property was interfered with during the revolutionary disturbances which occurred in Mexico during the year, beyond the breaking of some of the arc lamps by unruly crowds on a few occasions, and notwithstanding the disturbed conditions

of the country, the company's business has steadily increased. The increase in the sale of power has been very satisfactory. Especially is this so as regards the quantity of power taken by the Pachuca Light and Power Co., Ltd., and there is every indication that the mining companies in the Pachuca district will continue to increase their electrical equipment now that they can depend upon the regular supply of electric energy. During the year the Nexapa Reservoir was completed, and good progress made in the construction work of the Tenango Reservoir, which should be ready for use during the rainy season of 1912. The construction work to extend the system of canals and tunnels to divert several rivers in the Necaxa watershed has progressed satisfactorily so that the water from one of the rivers will be available by the end of the year 1912. Mr. Pablo Macedo has resigned from the board of directors, and Mr. E. D. Trowbridge has resigned the office of general manager. The directors have considered it wise, in appointing a new general manager, to unite more closely the management of this company and the Mexico Tramways Co., and therefore, Mr. Harro Harrsen, the general manager of the Tramways Co., has also been appointed general manager of this company. Mr. Alexander Strausz, jun., has been appointed treasurer in Mexico City in the place of Mr. Lloyd Lyon, resigned. In December the board also secured the services of Sr. Lic. Jose Vasconcellos as additional counsel and legal adviser in Mexico City. The board look for steady development and increased prosperity of the country in the near future, and, consequently, the further successful growth and profitable operation of the company's undertaking, and they desire to acknowledge the courtesy and consideration which the company and its officials have at all times received from the Government and the Federal, State and City officials in Mexico, and they have every reason to believe that the relations will continue to be as harmonious and as satisfactory as in the past. The directors express their great appreciation of the faithful services of Mr. R. C. Brown, managing director; Mr. Luis Riba, legal representative, and Mr. E. D. Trowbridge, the late general manager, and of the other officials of the company resident in Mexico.

Capacity of generating plants:—Necaxa, 94,000 H.P.; San Ildefonso and other small plants, 10,107 H.P.; Pachuca Light and Power Co., 12,140 H.P.; = 116,247 H.P.; add reserve steam plants in Mexico City, including Mexico Tramways Co. plant, 14,250 H.P., making a grand total of 130,497 H.P.

Installations connected:—

	1910.		1911.	
	No.	H.P.	No.	H.P.
Arc lamps	5,088		3,914	
Incandescent lamps ..	398,301	86,616	400,422	33,246
Motors		84,690		88,532
Total		121,306		121,778

Comparative statement of gross earnings and operating expenses (Mexican currency):—

	1909.	1910.	1911.
Gross earnings	$6,039,713	$6,990,308	$7,581,027
Operating expenses and maintenance	2,991,207	1,968,773	2,195,028
Net earnings	$3,048,506	$5,021,635	$5,385,999

Mexico Tramways Co.

THE annual meeting is to be held at Toronto on July 3rd. The annual report to December, 1911, shows that the operation of the company's undertaking during the year has been satisfactory. The net revenue in gold for 1911, after paying all expenses and fixed charges, amounted to $1,383,530, which with the balance brought forward from 1910, makes a total credit balance to profit and loss account for the year of $2,027,597, out of which the directors have, during the year, paid to the shareholders four quarterly dividends at the rate of 7 per cent. per annum: and have placed $86,913 to the reserve account, which now stands at $2,600,000. The above appropriations have absorbed $1,241,031, leaving a credit balance of $786,566 to be carried forward. The ratio of operating expenses to gross income was 48·57 as compared with 49·06 for 1910. The revolutionary disturbances which occurred in Mexico during the year did not seriously affect the company or its undertaking. During the whole period of the disturbances the gross receipts showed satisfactory monthly increases. On December 31st, 1911, the tramway system consisted of 195·06 miles of single track, of which 175·506 miles were operated by electricity and 19·554 miles by mules. The electric track mileage has been increased by 16·88 miles, and the mule tracks have been reduced by 1·76 miles. A new line between Mixcoac and the City of Mexico through the Calonia del Valle has been put into operation during the year, and has opened up an attractive residential district, and should be a satisfactory source of income to the company. The company has commenced the construction, under the concessions which it owns, of suburban lines to Puebla and Toluca, and anticipates completing during the year 1912, about seven miles of each line. It also contemplates the electrification of the mule line to Tlalnepantla and also the Santa Fe mule line which will form part of the Toluca line. The usual statistics regarding the company are appended to the report. They show that the physical condition of the company's undertaking in all departments is satisfactory. The whole property has been maintained in excellent condition and repair, and for this purpose $761,276·00 (Mexican currency) has been expended during the year on maintenance. During the year Mr. Pablo Macedo resigned from the board of directors, and M. Paul Eugene Dutasto of Paris, France, was appointed to fill the vacancy thus formed, while Chev. Robert de Bauer, of Brussels, Belgium, was appointed as an additional member of the board. Mr. Alexander Strausz, jun., has been appointed treasurer in Mexico City in place of Mr. Lloyd Lyon, resigned. In December, the board also secured the services of Sr. Lic Jose Vasconcellos as additional counsel and legal adviser in Mexico City. The management contemplates the construction of further extensions to meet the constant growth of the city and the electrification of some of the lines still operated by mules. In view of the fact that this company has such a large interest in the Mexican Light and Power Co., Ltd., the directors gladly consented, on the resignation of Mr. E. D. Trowbridge from the management of that company, to Mr. Harro Harsen, the general manager of this company, undertaking also the general management of the Mexico Light and Power Co., Ltd. The board believe that by placing the management of the two companies under one head, considerable economy and benefit will result to both undertakings. The board look for steady development and increased prosperity of the country under the new government, and, consequently, the further successful growth and profitable operation of the company's undertaking, and they desire to acknowledge the courtesy and consideration which the company and its officials have at all times received from the Federal, State and city officials in Mexico, and they have every reason to believe that the relations between the company and the Government will continue to be as harmonious and as satisfactory as in the past. The directors express their great appreciation of the faithful services during the past year of Mr. R. C. Brown, managing director, Mr. Luis Riba, legal representative, and Mr. Harro Harrsen, general manager, and of the other officials of the company resident in Mexico.

Aron Electricity Meter, Ltd.—The directors' report for the year ending March 31st, 1912, states that the profit and loss account for the year, after providing for general charges and depreciation, shows a net profit of £30,542, making, with the balance of £5,881 carried forward from last year, a total available profit of £36,423. Out of this amount the directors distributed in December last a dividend of 3 per cent. on the preference shares, absorbing £3,747, leaving to be disposed of £32,676. The directors recommend a further 3 per cent. on the preference shares, absorbing £3,747, and making a total for the year of 6 per cent.; a dividend of 6 per cent. on the ordinary shares, absorbing £7,500, and a transfer to reserve towards goodwill and patents of £10,000 (making this reserve £40,000), leaving a balance of £11,429. Out of this amount it is proposed to appropriate £6,973 towards writing off the expenses of the debenture issue of 1911, and to carry forward £4,456. The past year's trading in electricity meters and taximeters has again been most satisfactory, the sales having exceeded those of any previous year. The company's factories have been fully employed, and the necessary extensions to cope with the increased business are being carried out.

Electric and General Investment Co., Ltd.—The directors' report for the year ended May 31st, 1912, states that the gross profit on the transactions for the year was £17,978. After deducting all general charges, interest on debenture stock, the interim dividend already paid on the preference shares, and providing for the proportion of the final dividend accrued on the preference shares to May 31st, 1912, there remained a balance of £8,704. As a further reserve to meet depreciation in the company's investments, the directors have carried £2,978 of this amount to the contingencies fund, thereby raising the amount to the credit thereof to £82,000 as at May 31st, 1912, leaving £5,726. The directors recommend that this amount of £5,726 be appropriated as follows: Dividend at the full rate of 10 per cent. on the ordinary shares, £2,000; dividend of 6d. a share on the deferred shares, £1,000, carrying forward £2,726. The warrants for the dividends on the ordinary shares and deferred shares will be paid on July 1st

Havana Electric Railway Co.—The report of this company, as abstracted in the *Financier*, shows the following results for 1911: Gross earnings, $2,991,501; operating expenses, $1,519,303; earnings, less operating expenses, $1,472,198; fixed charges and taxes, $502,673; adjustments, $9,487; surplus earnings for the year, $960,036; surplus, January 1st, 1911, $1,114,913; total, $2,074,950. Dividends paid during the year 1911: 6 per cent. on preferred shares, 6 per cent. on common shares. Surplus, January 1st, 1912, $1,327,132. "These results have been obtained when the service of the company has been disturbed and at times almost demoralised by the torn-up condition of practically all of the streets, incident to the construction of a sewer system throughout the city. The increase of $334,521, or 12·59 per cent., in the gross earnings of the company in 1911 over those for the preceding year, and the increase of $180,857, or 14 per cent., in the earnings, less operating expenses, obtained under, or rather in spite of, most adverse operating conditions, is an excellent tribute to the efficient and capable management of Mr. Frank Steinhart, the general manager."

R. Waygood & Co., Ltd.—According to a financial paper, the accounts for the year ended March 31st show a profit, including £3,395 brought forward, of £31,604, out of which £3,000 has been written off investments and £2,000 placed to reserve. The directors recommend a further dividend of 4½ per cent., making 7 per cent. for the year, as compared with 6 per cent. for the preceding year, carrying forward £6,254.

MARKET QUOTATIONS.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, June 19th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16 10	..
a Copper Sulphate	„	£24 15	..
a Lead, Nitrate	„	£26 10	..
a „ White Sugar	„	£25 10	..
a „ Peroxide	„	£32	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	8½d.	..
a Potash, Caustic (88/90 %)	per ton	£22 10	..
a „ Chlorate	per lb.	3¾d.	..
a „ Perchlorate	„	4¼d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	75/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70/72 %)	„	£10 5	..
a „ Chlorate	per lb.	3½d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£75	£5 inc.
b „ Wire, in ton lots	„	£102	..
b „ Sheet, in ton lots	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	8¼d.	¾d. dec.
c „ Tube (brazed)	„	11¾d.	¼d. inc.
c „ „ (solid drawn)	„	9¾d.	¼d. inc.
c „ Wire, basis	„	9¼d.	¼d. inc.
c Copper Tubes (brazed)	„	1/0¾d.	¼d. inc.
c „ „ (solid drawn)	„	11¾d.	¼d. inc.
g „ Bars (best selected)	per ton	£96	£2 inc.
g „ Sheet	„	£96	£2 inc.
g „ Rod	„	£96	£2 inc.
d „ (Electrolytic) Bars	„	£81	£1 15s. inc.
d „ „ Sheets	„	£99 10	£3 5s. inc.
d „ „ Rods	„	£87 10	£3 5s inc.
d „ „ H.C. Wire	per lb.	10½d.	¼d. inc.
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/11	..
h Gutta-percha, fine	„	..	..
h India-rubber, Para fine	„	4/7½	..
i Iron Pig (Cleveland warrants)	per ton	54/1	5d. inc.
i „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£18 10s.	£1 inc.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8	5/- dec.
e Mica (in original cases) small	per lb.	6d. to 8s.	..
e „ „ „ medium	„	3/6 to 6/-	..
e „ „ „ large	„	7/6 to 11/-	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	10¾d.	¾d. inc.
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£208 to £209	£5 dec.
n „ Wire, Nos. 1 to 16	per lb.	2/5	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh's (Vieille Montagne bnd.)	„	£29 15	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

STOCKS AND SHARES.

Tuesday Evening.

THE principal feature of the present week, so far as the Electric markets are concerned, is the special settlement in American Marconi shares. This has absorbed much attention and attracted a huge amount of interest, not only because of the speculation in the shares themselves, but because of the influence which the gamble has had on markets remote from the Marconi section itself. Railway stocks have rather disappointed holders who were looking for a rise on the collapse of the transport strike. National Telephone stock has been moving with considerable velocity. Apart from these items there has not been a great deal eventful during the past week.

In the Home Railway market the Undergrounds constitute the most active department, and absorb the largest amount of attention, both speculative and otherwise. Metropolitans and Districts both spurted, but had to give way again on profit-taking; while City and South London Ordinary, after touching 40, went back to 38½, which leaves them unchanged on the week. Central London stocks are very steady, the coming opening of the Liverpool Street extension being the sheet-anchor of the bulls. East London Ordinary moved in lively fashion, and the Ordinary stock rose to 8¾, easing off to 8½ later. Notwithstanding the fact that the dock strike has well-nigh petered out, the position in the railway world is still obscure enough to cause anxiety in the Home Railway market, where dealers confess that they do not feel sure enough of the immediate prospect to make them wishful of taking lines of stock upon their books.

Underground Electric Railways are better, the shares rising ¾, and the Income bonds a point, upon prophecies—which certainly do not err upon the side of pessimism—that the latter will receive the full 6 per cent. dividend in respect of the current year. The company's "A" shares, after touching 16s., reverted to 15s. 6d. upon the slight recession of London General Omnibus stock from its record price of 400 which it attained the other day to 385. Better prices have developed in British Electric Traction shares upon digestion of the report; both Deferred and 6 per cent. Preferred are ½ higher, while the 6 per cent. Preference stock is better to the same extent, and the Second Debenture stock rose 1.

Changes in the English Electricity Supply group are limited. Folkestones have improved upon a little buying from the provinces, where, perhaps, the recent rise in Bournemouth & Poole has been noted as a possible example of what may happen in other quarters. So far as the London shares are concerned, Charing Cross Preference lost ½ and Cities fell 10s., the last-named on the statement issued the other day denying once more the rumours about the company being taken over by the Corporation. Counties continue very firm, there being buyers at the middle price; and, in spite of journalistic enterprise, there are still a few dealers left in this market, as in other markets round the Stock Exchange.

Mexico is declared—and with a good deal of authority—to be getting over her Revolution, and, as a consequence of this, Mexican issues are steadily going ahead. Various bonds of the Power Companies have improved this week. Mexican Trams at 124 are better on the dividend and report. Rio Trams again improved a little, and Sao Paulo gained the 2½ dividend which came off last Friday. The Anglo-Argentine Tramways group is also *ex* dividend, the deductions being reflected in the quotations. Port of Buenos Ayres Tramway shares have risen to 10s. 6d., the Preference to 15s., and the Debentures to par. Victoria Falls Power Preference improved to 19s. 6d. on the understanding that the company is doing much better, the shares also reflecting by sympathetic strength the firmness of the South African market. Para Electric Railways are ⅛ down, and most of the other movements in this section consist of small rises in prior-charge issues.

Marconis continue to rule the roost amongst Telegraphs. The prices on the week show a considerable improvement, which was shared by Canadians and Americans. The arrangement of the special settlement in the latter reveals no new trouble, and on this—or, rather, on the expectation that such would be the case—prices went ahead substantially. Americans were carried over at 1½, the rate being 6 per cent., and contangoes being done for the middle of July account. It may be recalled that the shares rose to 4 on the morning of their introduction to the market, since when they have been as low as 25s. Inspired information appears every now and then, following which there is, as a rule, a rally in the price, but holders have very little else to go upon at present. The capital of the Canadian Marconi Company, by the way, is $5,000,000, in 1,000,000 Ordinary shares of $5 each, fully paid, so it is not difficult to see that very substantial profits will have to be earned before holders at present figures receive a return on their money adequate to the chances they are taking. Still, it must be admitted that the market looks good for the time being, and prices might go better.

The fall in Great Northern Telegraphs has been further continued, and the price has got down to 29. Direct United States Cable shares are ¼ easier, but the Anglo-American group is steady. Speculators have been selling West India and Panama Telegraphs, while, on the other hand, the company's First Preference shares are ¼ harder. Reuters have recovered a little, and the Eastern group is firm.

National Telephone Deferred slumped to 140—a drop of 10 points—on the opening of the arbitration case between the Government and the company. Then came a smart recovery of 5 points, and doubtless we shall be treated to these swift fluctuations while the inquiry lasts. The market, as we were saying last week, is very dangerous for the ordinary man. The company's Third Preference shares are ¼ down, while the Preferred stocks keep steadily at 101½.

The manufacturing group is noticeable for falls in Edison & Swan shares of both kinds. The "A" shares are ⅛ lower, and the fully paid ¼ down, there being some pressure to realise in an unwilling market. British Insulated and Helsby Cable shares are good, rising no less than 15s. on the improvement which has been taking place just lately in Automatic Telephone shares, the British Insulated, of course, being the parent of the Automatic Telephone Company. The shares in the last-named are about 35s., after being nearly £2, and they are being dealt in freely. Babcock & Wilcox have begun to creep up in their new form, but Willans & Robinson fell ⅛. A slight improvement in General Electric Preference is balanced by a fall in India-Rubber shares, while the rubber share market, after making one or two ineffectual efforts to go better, relapsed into depression upon renewal of the apprehensions regarding synthetic rubber. The Aron Company's report is distinctly satisfactory, but there is no change in the prices of the shares.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 18th.	Rise + or Fall —	Present Yield p.c.
	*	1910.	1911.			£ s. d.
Bournemouth & Poole, Ord.	10	5½	5½	9½ — 10½	..	5 4 9
Do. 4½ % Pref.	10	4½	4½	8½ — 9½	..	4 12 2
Do. Second 6 % Pref.	10	6	6	10¾ — 11	..	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	100 —102	..	4 8 8
Brompton & Kensington, Ord.	5	10	10†	8½ — 8¾	..	5 14 8
Do. 7 % Cum. Pref.	5	7	7	7⅞ — 8⅛	..	4 6 2
Central Electric Supply, 4 % Guar. Deb.	100	4	4	97 —100	..	4 0 0
Charing Cross, West End & City	5	5	5	4½ — 5	..	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4½ — 4⅝	— ⅛	4 17 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	8¾ — 4⅜	..	5 2 10
Do. Do. % Deb.	100	4	4	93 — 95 xd	..	4 1 8
Chelsea, Ord.	5	5	5	4⅜ — 4⅞	..	5 2 7
Do. 4½ % Deb.	Stock	4½	4½	99 —102	..	4 8 8
City of London, Ord.	10	7	8	17½ — 19½	— ½	4 2 1
Do. 6 % Cum. Pref.	10	6	6	15 — 17	..	3 10 7
Do. 6 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	101 —104	..	4 6 7
County of London, Ord.	10	5	6	10⅜ — 11⅛	..	5 7 0
Do. 6 % Pref.	10	6	6	11⅜ — 11⅝	..	5 1 1
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	100 —103	..	4 8 8
Edmundson's, Ord.	5	Nil	Nil	¼ — ⅜	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3 — 3½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	86 — 89	..	5 1 2
Folkestone	5	6	6	4⅞ — 5⅛	+ ⅛	5 14 3
Do. 5 % Cum. Pref.	5	5	5	4¾ — 5⅛	+ ¼	4 15 3
Do. 4½ % First Deb.	100	4½	4½	94 — 97	+1	4 12 9
Hove	5	9	9	6⅞ — 7⅛	..	6 4 2
Kensington & Knightsbridge, Ord	5	9	9	7⅞ — 7⅞	..	5 16 2
Do. 4 % Deb.	Stock	4	4	92 — 95	..	4 4 3
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	2½	1⅛ — 1⅜	..	4 5 6
Do. 6 % Pref.	5	6	6	4⅛ — 5½	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	90 — 93 xd	..	4 6 0
Metropolitan	5	5	4	3⅝ — 4⅛	..	5 1 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4¼	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	101 —104	..	4 6 7
Do. 3½ % Mort. Deb.	Stock	3½	3½	85 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96 — 98	..	4 11 10
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4½ — 5	..	5 0 0
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	97 —100	..	5 0 0
Notting Hill, 6 % Non-Cum. Pref.	10	..	6	10½ — 11½	..	5 6 8
Oxford	5	7½	7½	5⅞ — 6⅛	..	5 13 9
St. James' and Pall Mall, Ord.	5	10	10	8 — 8½	..	5 14 3
Do. 7 % Pref.	5	7	7	6⅞ — 7⅛	..	4 15 0
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Smithfield Markets, Ord.	5	Nil	2	1⅛ — 1⅜	..	..
South London, Ord.	4	5	5	2⅛ — 2⅜	..	6 8 0
Do. 5 % First Mort. Deb.	100	5	5	100—103	+1	4 17 1
South Metropolitan, 7 % Pref.	1	7	7	1⅛ — 1⅜	..	6 1 0
Do. 4½ % First Deb. Stock	100	4½	4½	96 — 99	..	4 11 0
Urban, Ord.	5	5	..	¼ — ⅜	..	..
Do. 5 % Cum. Pref.	5	5	2	2½ — 3	..	3 6 8
Do. 4½ % First Mort. Deb.	100	4½	4½	86 — 88	..	5 2 3
Westminster, Ord.	5	10	10	8½ — 8⅝	..	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	5⅛ — 5⅜	..	4 4 8

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5⅜ — 5⅞	..	5 2 2
Calcutta, Ord.	5	8½	8½	7⅝ — 7⅞	— ⅛	5 11 6
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	97½ — 99½	+ ½	5 0 6
Canadian Gen. El. Com.	$100	7	7†	112 —116	..	6 0 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	3†	1⅜ — 1⅝	..	3 4 0
Do. 5 % Deb.	100	5	..	94 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92½ — 94½ xd	..	6 7 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	83 — 86	..	5 16 8
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	94½ — 96½	..	5 3 8
Kalgoorlie Elec. P. and Lt., Ord.	10/-	Nil	..	7/16 — 9/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	8 6 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	106 —108	..	4 12 7
Madras, Ord.	5	..	..	2½ — 2⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	104 —107	..	4 13 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	91 — 93	+ ½	5 7 6
Mexican Lt. & Power, Common	$100	4	4	91 — 93	..	4 6 0
Do. 7 % Cum. Pref.	$100	7	7	105 —107	..	6 10 10
Do. 5 % 1st Mort. Gold Bds.	..	5	5	97½ — 99½	+1	5 0 6
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	88½ — 90½	..	5 10 6
Montreal, Lt., H. and Power	$100	7	8	211 —215	..	3 14 5
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5	39 — 42	..	11 18 2
River Plate, Ord.	Stock	10	10	240 —250	..	4 0 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	109 —114	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	103 —105	..	4 15 3
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	139 —143	..	3 10 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	111½ — 113½	..	4 8 1
Do. 4½ % Per. Deb.	Stock	4½	4½	103 —105	..	4 5 9
Toronto Power, 4½ % Deb.	Do.	4½	4½	98½ — 100½ xd	..	4 9 7
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92½ — 94½	..	5 5 10
Victoria Falls Power, Pref.	1	Nil	11¾d.	15/16 — 1	+ 1/32	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	105½ — 107½	..	5 11 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	4†	7⅜ — 7⅝	..	..
Do. 5 % Deb. Red.	Stock	5	5	97½ — 99½	..	5 0 6
American Telep. & Teleg., Cap.	$100	8	8†	148½ — 150½	..	5 6 4
Do. Collat. Trust	$1000	4	4	96½ — 97½	..	4 2 1
Anglo-American Telegraph	Stock	3½	3	65 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	109 —110	..	5 9 1
Do. Def.	Do.	80/-	80/-	25¼ — 26	..	5 15 5
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	..	7⅜ — 8	..	4 10 4
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	82 — 85	..	4 14 2
Cuba Telegraph	10	6	6†	9½ — 10⅛	..	5 14 3
Do. 10 % Pref.	10	10	10	16⅞ — 17½	..	5 14 3
Direct Spanish Telegraph, Ord.	5	4	4†	8⅛ — 8⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	7 — 7⅛	..	6 9 0
Direct United States Cable	10	4½	5	7⅜ — 7⅝	— ⅛	6 7 0
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 1
Eastern Telegraph, Ord. Stock	Stock	7	5†	130 —133	..	5 5 3
Do. 3½ % Pref. Stock	Do.	3½	3½	78 — 80	— ½	4 7 6
Do. 4 % Mort. Deb.	Do.	4	4	99 —101	— ½	3 19 3
Eastern Extension	10	7	5†	12⅜ — 13½	..	5 5 8
Do. 4 % Deb.	Stock	4	4	99 —101	..	3 19 3
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	97 —100	..	4 0 0
Globe Telegraph and Trust	10	5⅞	6†	11 — 11½	..	5 4 4
Do. 6 % Pref.	10	6	6	13 — 13½	..	4 9 0
Great Northern Telegraph	10	18	18	28½ — 29½	— ½	6 2 0
Indo-European Telegraph	25	13	5†	56 — 58	..	5 12 1
Mackay Companies Common	$100	5	5	86 — 89 xd	+5½	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	70 — 73 xd	+1	5 9 7
Marconi's Wireless Telegraph	1	5	20	6⅛ — 6⅜	+ 1/16	3 4 0
Do. 7 % Cum. Partic. Pref.	1	16	17	5⅛ — 5⅜	+ ⅛	3 3 2
Monte Video Telephone, Ord.	1	6	6	1 — 1⅛	..	5 6 8
Do. 5 % Pref.	1	5	5	⅜ — ½	..	5 14 3
National Telephone, Pref.	Stock	6	6	100 —103	..	..
Do. Def.	Do.	6	6	143 —145	—6	..
Do. 5 % Non-cum. 3rd Pref.	5	5	5	6 — 6½	— ⅛	..
New York Telep., 4½% Gen. Bnds.	100	4½	4½	99 —100	..	4 10 0
Oriental Telep. and Elec.	1	8	8	1⅛ — 1⅜	..	4 13 0
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅛	..	4 16 0
Do. 4 % Red. Deb.	Stock	4	4	89 — 91	..	4 8 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	+ ⅛	3 18 5
Reuter's	8	5	5†	11⅜ — 11⅞	+ ⅛	3 8 0
Submarine Cables Trust	Cert.	6	6	127 —130	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ — 101½	+ ½	4 8 8
United River Plate Telephone	5	8	8	7⅛ — 7⅞	..	5 0 10
Do. 5 % Cum. Pref.	5	5	5	4⅞ — 5⅛	..	4 8 11
West Coast of America	2½	2½	2½	1⅜ — 1⅝	..	4 0 0
Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4	4	96 — 98	..	4 1 8
West India and Panama Teleg.	10	1½	⅓	2⅜ — 3	— ⅛	1 13 4
Do. 6 % Cum. 1st Pref.	10	6	6	10½ — 10⅞	+ ⅛	5 11 7
Do. 6 % Cum. 2nd Pref.	10	6	6	9½ — 10½	..	5 17 1
Do. 5 % Debs.	100	5	5	102½ — 104½	..	4 15 3
Western Telegraph, Ltd.	10	7	6†	18½ — 19⅜	..	5 2 9
Do. 4 % Deb.	Stock	4	4	98 —100	..	4 0 0
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	100 —103	..	4 7 5

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations June 18th.	Rise + or Fall —	Present Yield p.c. £ s. d.
	*					
Bath Trams, Pref. Ord.	1	Nil	Nil	⅞ — 1⅛	..	Nil
Do. 5 % Pref.	1	5	5	1⅛ — 1⅜	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	78 — 83	..	5 8 5
Brit. Elec. Trac., 6 % Pref.	100	..	..	11 — 13	+ ½	..
Do. Do. Deferred	100	..	..	6 — 8	+ ½	..
Do. Do. 6 % Cum. Pr'f.	100	..	6	93½ — 95½	+ ½	6 5 8
Do. 7 % Non-Cum. Pr'f.	100	..	..	42 — 46	−1	..
Do. 5 % Perp. Deb.	100	5	5	93 — 97	..	5 3 1
Do. 4½ % 2nd Deb.	100	4½	4½	80 — 84	+1	5 7 2
Central London Railway, Ord.	100	3	3	79 — 81	..	3 14 1
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	2	78 — 80	..	2 10 9
Do. 4 % Deb.	100	4	4	101 —103	..	3 17 8
City & South London, Ord.	100	1½	1⅝	38 — 39	..	4 3 4
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 15 3
Do. Do. 1901	100	5	5	104 —106	..	4 14 4
Do. Do. 1908	100	5	5	103 —105	..	4 15 3
Do. 4 % Deb.	100	4	4	99 —101	..	3 19 3
Dublin United Trams, 6 % Pref.	10	6	6	10⅜ — 11⅜	..	5 2 2
Great Northern & City, Pr'f. Ord	10	Nil	..	1⅝ — 1⅞	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	6	¾ — ⅞	..	8 0 0
Do. 4½ % Deb.	100	4½	4½	71 — 76	..	5 18 5
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2¼ — 2⅜	..	4 11 0
Do. 4 % Deb.	100	4	4	75 — 80	..	5 0 0
Lancashire United, 5 % Deb.	100	5	5	83 — 85	..	5 17 8
London Elec. Railw'ys, 4 % Deb.	100	4	4	97 — 99	..	4 0 10
London United Trams, 5 % Pref.	10	Nil	..	5½ — 5⅝	..	..
Do. 4 % Deb.	100	4	4	77 — 80	..	5 0 0
Metropolitan Railway Consol.	100	1⅜	1⅞	64½ — 65	..	2 17 9
Do. Surplus Lands	100	2⅜	2⅞	67 — 69	..	4 3 4
Do. 3½ % Deb.	100	3½	3½	89 — 91	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	86 — 88	..	3 19 7
Do. 3½ % Con. Pref.	100	3½	3½	87 — 89	..	3 18 8
Metropolitan District Ord.	100	Nil	..	42½ — 43	..	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	96 — 98	..	4 1 8
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 3
Do. 4½ % First Pref.	100	3⅞	4½	90 — 92	..	4 17 10
Do. 3½ % Gtd.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan Elec. Trams, Ord.	1	5/9	6	⅛ — 1	..	6 0 0
Do. Def.	1	Nil	..	3/32 — 1/8	..	Nil
Do. 5 % Pref.	1	5	5	29/32 — 1 1/32	..	5 10 6
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % Deb.	100	5	5	98 —100	..	5 0 0
Potteries, Ord.	1	2	..	5/16 — 7/16	..	..
Do. 5 % Pref.	1	5	5	¾ — ⅞	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	6	..	11/16 — ¾	..	7 7 8
Do. 4 % Deb.	100	4	4	72 — 77	..	5 4 0
Underground Elec. Railways	10	..	..	4½ — 4¾	— ⅛	Nil
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1	1†	90 — 92	+1	..
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	..	3 — 3½	+ ⅛	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 84	..	5 7 2

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½	5⅜ — 5 7/16 xd	..	5 1 2
Do. 2nd Pref.	5	5	5½	4 13/16 — 5⅜ xd	..	5 6 0
Do. 4 % Deb.	100	4	4	94½ — 96 xd	..	4 3 4
Do. 4½ % Deb.	100	4½	4½	99½ —101½	..	4 8 8
Do. 5 % Deb.	100	5	5	101 —103	— ½	4 17 1
Auckland Trams, 5 % Deb.	100	5	5	104 —106	..	4 14 4
Bombay Elec. S. & Trams, Pref.	10	6	6	11½ — 11⅝	..	5 3 3
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brisbane Trams Invt., Ord.	8	8	8	6⅞ — 7⅛	..	..
Do. 5 % Pref.	5	5	5	4⅝ — 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
B. Columbia Elec. Rly., Def.	100	8	8†	140 —144	..	5 11 1
Do. Pref. Ord.	100	6	6	124 —127	..	4 14 6
Do. 5 % Pref.	100	5	5	111 —114	..	4 7 9
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99½ —102½	+1	4 7 10
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	102½ —104½	—½	4 6 2
Calcutta Trams, Ord.	6	6	7	6⅜ — 6⅝	..	5 5 8
Do. 5 % Pref.	5	5	5	4 13/16 — 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	100 —103	..	4 7 5
Cape Electric Trams	1	Nil	2½†	⅜ — ½	..	..
City Buenos Aires Trams (1904)	5	5	5	5 1/16 — 5 3/16	..	4 10 6
Do. 4 % Deb.	100	5	5	101 — 103	..	4 17 3
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	94 — 98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	101 —104	..	4 16 2
Kalgoorlie Elec. Trams	1	Nil	..	7/16 — 9/16	..	Nil
Do. 5 % A Deb.	100	5	5	89 — 93 xd	..	5 7 6
Do. 6 % B Deb.	100	5	6†	56 — 60	..	10 0 0
La Plata Elec. Trms, Ord.	1	..	..	⅛ — ¼	..	..
Do. Pref.	1	6	6	3/32 — 1/4	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6	1 — 1¼	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	94 — 98	—1	5 2 0
Madras Elec. Tr. (1904), Deb.	100	5	5	102 —104	+1	4 16 2
Manaos Trams & Lt., 1st Deb.	100	5	5	92 — 95	..	5 5 3
Manila Elec. R. and Lig., Bonds	$1000	5	5	102 —104	— ½	4 16 2
Mexico Trams Com.	$100	7	7	123 —125	+1	5 12 0
Do. Gen. Con. 5 % Bonds	..	5	5	98½ —100½	..	4 19 6
Do. 6 % Bonds	100	6	6	104 —106½	+ ½	5 12 8
Para Elec. Rlys. & Lt., Ord.	5	10	10	6 7/16 — 7 1/16	— ⅛	6 18 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	7 0 4
Do. 5 % 1st Deb.	100	5	5	100 —102	..	4 18 0
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	1 5/16 — 1 15/16	..	1 18 4
Do. 5 % 1st. Deb.	100	5	5	101 —104	..	4 16 2
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 5⅝	..	5 6 8
Do. 4½ % 1st Deb.	100	4½	4½	99 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	141½ —143½	+ ½	3 9 8
Do. 1st Mort. 5 % Bonds	..	5	5	106 —107	+ ½	4 13 6
Do. 5 % Mort. Bonds	100	5	5	99 —100	..	5 0 0
Sao Paulo Tram, Lt. and P.	$100	10	10†	248 —253	+2½	3 19 0
Do. 5 % 1st Deb.	$500	5	5	105½ —107½	..	4 13 0
Singapore Trams, 5 % Deb.	100	5	5	80 — 83	..	6 0 6
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	6	7	5½ — 6	+1	6 1 11
Do. 6 % Pref.	5	6	6	5 — 5½	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	100 —103	..	4 17 1
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104½ —106½	..	4 4 6

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	11/16 — 13/16	..	7 7 8
Do. 6 % Pref.	1	9	6	29/32 — 15/16	..	7 2 2
Babcock & Wilcox	1	26	28	3½ — 3⅝	+ 1/16	..
Do. Pref.	1	6	6	1⅝ — 1⅞	..	3 18 10
B.I. & Helsby Cables	5	10	10	7½ — 8½	+ ½	6 1 3
Do. Pref.	5	6	6	6½ — 6¾	+ ¼	4 9 0
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
British Thomson-Houston, Deb.	100	4½	4½	96 — 98	+1	4 11 10
British Westinghouse, Pref.	8	Nil	..	1/16 — 1/8	..	Nil
Do. Deb.	100	4	4	61 — 64	..	6 5 0
Do. 6 % Prior Lien	100	6	6	101 —104	+1	5 15 5
Browett, Lindley, Ord.	1	Nil	..	1/8 — 2/-	..	Nil
Do. Pref.	1	Nil	..	5/- — 6/-	..	Nil
Brush, 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	77½ — 82½	..	6 1 3
Do. 4½ % Deb.	100	4½	4½	54 — 59	..	7 10 6
Do. 4½ % Second Deb.	100	4½	4½	37 — 42	..	10 14 4
Callender's Cable	5	15	10†	10⅜ — 11½	..	6 10 5
Do. Pref.	5	5	5	5 — 5⅛	..	4 15 3
Do. Deb.	100	4½	4½	100 —102	..	4 8 3
Castner-Kellner	1	17½	20	8½ — 8⅝	..	5 10 2
Do. Deb.	100	4½	4½	105 —109	..	4 10 7
Crompton & Co.	3	Nil	Nil	⅜ — ½	..	Nil
Do. Deb.	100	5	5	58 — 68	..	7 7 1
Dick, Kerr	1	5	..	37/64 — 39/64	..	5 8 1
Do. Pref.	1	6	6	1 1/16 — 1 1/8	..	5 12 11
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £5 paid	5	Nil	..	3/32 — 1/8	— 1/16	Nil
Do. fully paid	5	Nil	..	1⅛ — 2⅛	— ¼	Nil
Do. 4 % Deb.	100	4	4	68 — 72	..	5 11 1
Do. 5 % Second Deb.	100	5	5	75 — 78	..	6 8 2
Electric Construction	2	Nil	2½†	½ — 1	..	..
Do. Pref.	2	7	7	1½ — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7½ — 8½	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	9½ — 9⅝	+ ⅛	5 4 0
Do. Deb.	100	4	4	85 — 90	..	4 8 11
Henley's, Ord.	5	15	10†	11⅜ — 12½	..	6 0 0
Do. Pref.	5	4½	4½	4 15/16 — 5⅜	..	4 6 9
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	10	..	8 — 9	— ½	..
Do. Pref.	10	5	5	9½ — 10½	..	4 17 7
Telegraph Construction	12	20	10†	33 — 35	..	6 19 5
Do. Deb.	100	4	4	99½ —101½	..	4 9 0
Willans & Robinson	1	Nil	..	1/16 — ⅛	— 1/16	Nil
Do. Pref.	5	Nil	..	½ — 1	..	Nil
Do. Deb.	100	4	4	58 — 60	..	6 13 4

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 3 per cent., May 9th, 1912.

PROCEEDINGS OF INSTITUTIONS.

The Transmission of Electrical Energy by Direct Current on the Series System.

By J. S. HIGHFIELD, M.I.E.E.

(Abstract of paper read before the INSTITUTION OF ELECTRICAL ENGINEERS, *at Glasgow, June 12th,* 1912).

(Concluded from page 988.)

BEFORE deciding upon the use of the earth for regularly carrying considerable currents, it was necessary to make sure that such use would not cause interference with other electrical systems, and would not cause damage to property. M. Thury has carried out a great deal of work on this subject, and the town of Lausanne was supplied from St. Maurice through a single conductor with the earth as the return for 443 days continuously. Iron earth-plates were used, and during the whole time of their use it was found that their resistance changed very little. The current was 150 amperes, and theoretically the plates should have been oxidised away in less than two months, but apparently, after a layer of oxide has been formed, further action is very slow. The total resistance of the earth connections was about 1·6 ohms, and it was found that no inconvenience was experienced in connection with telegraphs and telephones.

Experiments were carried out in order to obtain the following information, namely :—

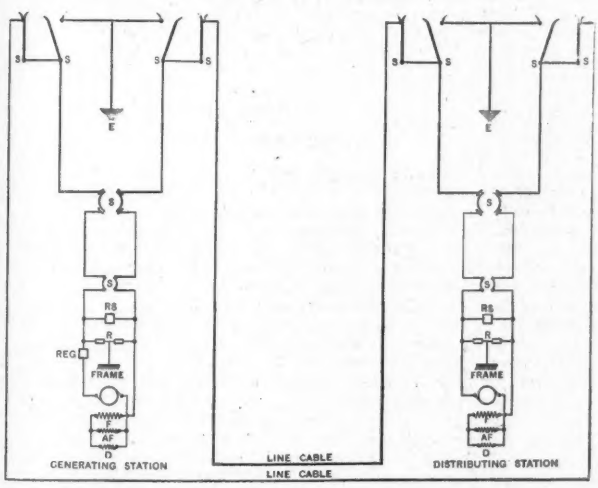
(*a*) At what depth below the surface must the plates be buried in order that the effect of currents at or near the surface should be negligible.

(*b*) The size of plates to be used, and their number.

(*c*) The distance apart at which the plates should be situated.

(*d*) The value of the earth resistance and its constancy.

With the first object in view, four iron plates were buried in the earth, situated vertically above each other, as indicated in the diagram (fig. 8). The area of each plate was 4 ft. × 2 ft. 2 in.,



S, Main switch; RS, Automatic switch; R, Pressure-limiting resistance; REG, Regulator; F, Main field coil; AF, Auxiliary field; D, Diverter.

FIG. 7.—DIAGRAM OF CONNECTIONS.

with the exception of the top plate, which consisted of a length of 6-in. pipe. These plates were made one pole of a circuit, the other pole consisting of large masses of iron buried in the ground round the works, chiefly condensing water pipes of very large size, which make an excellent earth, the resistance of which was found to be negligible as compared with the resistance of the test plates. The following observations were made :—

1. With a steady current of 20 amperes passing between the earth-plate, 20 ft. deep, and the large main earth, the measurements were :—

Between the Earth-plate and—

A point 120 ft. away	165·0 volts.
A point 60 ft. away	165·0 ,,
The surface earth-plate	163·5 ,,

Between the Surface Earth-plate and—

A point 120 ft. away	0·024 volt.
A point 60 ft. away	0·016 ,,

Between the Earth-plate, 10 ft. Underground, and—

A point 120 ft. away	0·035 volt.
A point 60 ft. away	0·024 ,,

2. With a steady current of 21 amperes passing between the earth-plate, 30 ft. deep, and the large main earth, the measurements were :—

Between the Earth-plate and—

A point 120 ft. away	135·0 volts.
A point 60 ft. away	134·5 ,,
The surface earth-plate	133·5 ,,

Between the Earth-plate, 10 ft. Underground, and—

A point 18 ft. away	0·008 volt.

Between the Surface Earth-plate, and—

A point 120 ft. away	0·020 volt.
A point 60 ft. away	0·010 ,,
A point 18 ft. away	0·004 ,,

Pressure readings were also taken between the surface-plate and spikes driven into the ground at various points.

All the above readings were taken with the positive pole of the generator connected to the test plate.

The foregoing experiments indicated that the pressure fall occurred at the plate itself, and that when the current was carried to a depth of only 10 ft., the pressure drop in the neighbourhood of the plate was exceedingly small.

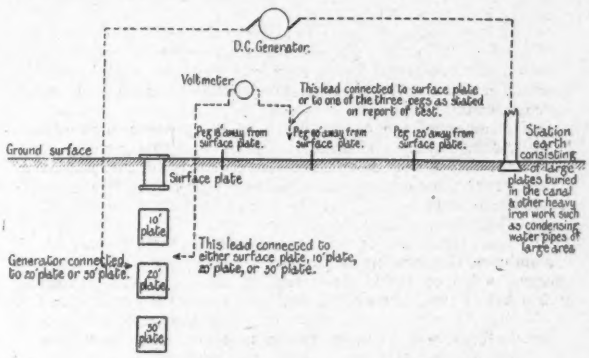

D.C. Generator.
Voltmeter
This lead connected to surface plate or to one of the three pegs as stated on report of test.
Peg 6' away from surface plate.
Peg 60' away from surface plate.
Peg 120' away from surface plate.
Station earth consisting of large plates buried in the canal & other heavy iron work such as condensing water pipes of large area
Ground surface
Surface plate
10' plate
20' plate
30' plate
This lead connected to either surface plate, 10' plate, 20' plate, or 30' plate.
Generator connected to 20' plate or 30' plate.

FIG. 8.—EARTH-PLATES AND CONNECTIONS.

Further tests were made by using the pilot wire as the test wire, and taking readings of the difference in pressure between Willesden and an earth-plate in the Brent River, about 1 mile from Southall. Using the pilot wire connected in parallel with the earth, a current of 3 milliamperes was observed without the current in the earth, and 8 milliamperes with 90 amperes flowing, the resistance of the pilot wire being 279 ohms ; the difference in pressure between the earth at Southall and Willesden due to the earth current was 1·4 volts.

The latter tests were made by the Post Office engineers.

A series of experiments was carried out with different sizes of plates suspended in the canal ; the results show that with a current of 1 ampere per 600 sq. in. of plate, little advantage is obtained by making the plate larger.

Further readings were taken in order to show the difference

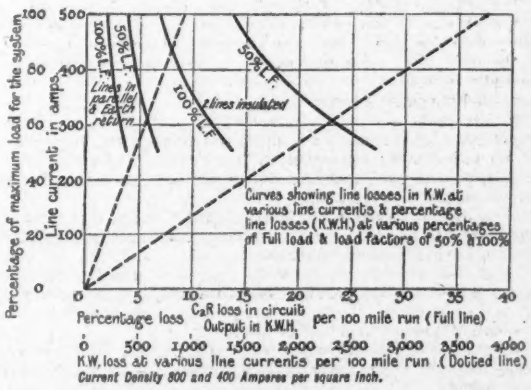

Percentage of maximum load for the system
Line current in amps.
100
80
60
40
20
0
500
400
300
200
100
100% L.F.
50% L.F.
Lines in parallel & Earth return
Lines insulated
Curves showing line losses in K.W. at various line currents & percentage line losses (K.W.H.) at various percentages of full load & load factors of 50% & 100%
0 5 10 15 20 25 30 35 40
Percentage loss C²R loss in circuit / Output in K.W.H. per 100 mile run (Full line)
0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000
K.W. loss at various line currents per 100 mile run (Dotted line)
Current Density 800 and 400 Amperes per square inch.

FIG. 9.

between the conductivity of the connection in water and in clay and also to show the effect of using three plates situated close together and the same plates situated at various distances apart. The results indicate that there is little advantage in spacing the plates a greater distance apart than 6 ft., and that plates buried in clay have more than twice the conductivity of similar plates immersed in water. When the plates are buried at a distance of 6 ft. apart, practically the maximum conductivity is obtained, and plates at this distance apart have nearly twice the conductivity of plates 1 ft. apart.

Before completing the above experimental work, earths were made at Willesden and Southall in the following way : At each place three boreholes were made, each borehole having a diameter of 7 in. and a depth of approximately 35 ft. This gave a current of 33 amperes per plate, and it was considered that the plates could carry this current for temporary use ; for permanent use, however, probably six plates would be required. The earth-plates consisted of cast-iron pipes having an outside diameter of 6 in. and a length of 9 ft. To each plate an insulated cable was bonded, and

after the pipe was placed in the borehole, the space round it was filled in with chalk, the cable being brought up to the surface by means of an insulating tube. The plates at Willesden are all buried in ordinary London clay, and at Southall in fine gravel, which is generally very dry. After the system was started for permanent supply, careful measurements were made in order to ascertain what variations took place in the resistance of the earth connections. The resistance of the two earths is almost exactly 1 ohm, so that although only three plates were used the earth is a very effective one.

All the experiments show that plates buried at a considerable depth offer less resistance than plates buried at the surface; this is due largely to the heavy pressure on the plate when buried at a depth.

When the earth is put in parallel with either cable, with 90 amperes in the main circuit, 30 amperes flow through the cable and 60 amperes through the earth, so that the ordinary resistance of the two earths is approximately one-half the resistance of either cable.

An earth will now be made by driving a shaft 5 ft. in diameter to a depth of 30 ft., and six earth-plates, consisting of cast-iron pipes 6 in. in diameter and 3 ft. long, will be buried radially at the bottom; in this way it will be possible to keep a close observation of their condition.

The commercial use of the earth as a conductor may be very great. When used as a spare conductor it saves the cost of a spare cable; the cost of the earth connections is a negligible matter as compared with the cost of the cable, and where a very long transmission is required—say, 100 miles—the advantage is immense. A line of 100 miles consisting of two 0·125 sq. in. conductors will have a total resistance of 68·3 ohms, so that with a current of 100 amperes, the number of kilowatts required to keep the line charged is 683, or nearly 7 per cent. of the maximum capacity of 10,000 KW. at 100,000 volts. Using an earth return with the same two cables in parallel, and assuming that the earth resistance is 1 ohm (a figure which can be readily obtained) the total resistance would be 18 ohms, and the number of kilowatts to keep the line charged would be 180 KW., or 1·8 per cent. of the total capacity of the line. In the latter case, either conductor would carry the full load of the system, so that a complete duplicate transmission system is provided for.

The line loss admits of ready calculation, and I find that the most convenient method is to arrive at the mean power to keep the line charged, to estimate the annual cost of running the necessary plant, and to treat this cost as a standing charge.

I show in the form of curves on fig. 9 the amount of the line losses at the various load factors, efficiencies and percentages of the maximum load for which the system is designed. The curves show the value of the losses with a completely insulated system, and for the same system operated with two wires in parallel and with the earth used as the return.

The actual working efficiency of the system described is of little value, as the load at present is small—only some 300 KW. For the last six months the ratio of the three-phase energy sent out at Southall to the direct-current input from Willesden was 77 per cent, and during this time the maximum A.C. load has not exceeded 275 KW.

The actual operating of the plant is exceedingly simple. The first generator is run up to speed by means of its starting motor, either with the mains open or on short circuit, and the regulator is set to give the proper line current; an incoming generator is generally started from the direct-current side, and the motor paralleled into the circuit.

The sub-station motors are started by opening the switch and rotating the brushes until full speed is reached, when the regulator is put into action; the speed can be very closely adjusted, so that paralleling the sub-generators is a particularly easy operation, one man attending to the plant.

With several generators in series all fully loaded, any failure to one necessitating its removal from the circuit results only in the slowing down of the whole plant.

When two insulated mains are in use, an earth at any point does not interfere with the supply; the voltmeters at once show which main is injured, and it can be cut out of circuit after the system has been earthed at each side of the fault.

When running on one cable with earth return, an earth on the cable will cut out all sub-stations beyond the point where the fault occurs.

The present safe limit of pressure on a single commutator appears to be about 5,000 volts. Consequently for a maximum line pressure of 50,000 volts, ten machines are required, and if these are driven in pairs, five units of plant are required in the system. The output of each unit depends on the line current adopted; a 300-ampere line would require five units each of 3,000-KW. output.

It does not seem likely that these high-tension direct-current generators can be built to run at steam turbine speeds, but a turbine drive is now available by the use of the beautiful double helical gear employed by Sir Charles Parsons for driving slow-speed propellers in marine work. A very good plant unit would consist of separate high- and low-pressure turbines each driving by gearing one or two slow-speed generators. Careful designing is required for the couplings, but there appear to be no serious difficulties in constructing plant units of very large size.

I believe that the day will come when internal combustion engines of large size will be used to supplement the steam turbine in our power stations, and for such work the series system offers special advantages, owing to the fact that it is independent of any ordinary speed variations and is clear of all the difficulties inherent in parallel running.

The cost of a series D.C. power station where either water turbines, Diesel, gas, or reciprocating steam engines are used is generally not more than that of a similar alternate-current station. Where large steam turbine stations can be used, direct-current plant of similar output would be more expensive.

The cost of the sub-station plant and gear is about the same as that of an A.C. motor-generator station working at any pressure suitable for direct use on the motors; if step-down transformers are required, the advantage will generally be with the D.C. station.

The transmission line is far less costly than a three-phase line of similar capacity. The actual cost of the line, having a capacity of 10,000 KW., with one cable disabled, worked out at £1,600 per mile; this includes the two cables laid in cast-iron pipes and a telephone cable, and the cost of the earth connections at each end. The cost of a single three-phase armoured cable of 5,000 KW. capacity at 20,000 volts including cost of laying is about £3,000 per mile, or twice the cost without any provision for breakdown. For certain work the series system and series-wound constant-current machines possess great advantages as to cost and convenience over other systems. For very long-distance transmission, especially where underground mains are necessary, it is possible where the A.C. system is not possible. Where energy has to be taken to a great city from a distance, whether from a water-power station or a steam station situated at the coalfields, the underground system offers great advantages, as compared with the overhead system, in respect of security of supply and cost of maintenance. In many instances the underground direct-current system can be laid at no greater cost than the three-phase overhead system. The system might be advantageously used for railway supply, especially where water-power is available, since it enables a very long line to be fed from a single power station. It is nearly as easy and inexpensive to insulate for 100,000 volts as for 20,000 volts; all that is necessary is to design the couplings and machine insulation for the higher pressure. With this high pressure, any practicable distance from a power station is possible.

The series machine is well adapted for any special work where variable speed is required, as for driving winding and hauling gear, and for rolling mills. It has been found economical to install a separate series system consisting of a generator and motor, the former driven by a three-phase motor, to drive a single winding gear. The great advantage for these purposes is, of course, the combination of constant torque with any degree of speed variation and the absence of the losses incurred in any form of rheostatic control. The whole of the plant and cables for the western area supply were built in this country.

DISCUSSION.

The discussion on Mr. Highfield's paper was opened by MR. ROGER T. SMITH (G.W.Ry.), who confined himself almost entirely to the author's remarks on the system as applied to railways, pointing out that he made the reservation that his remarks only applied to transmission between a generating station and a sub-station, and not to any use the current might be put to on the other side of a sub-station. He went on to speak of the tracks alongside of the railway lines, and pointed out that these were not always continuous or of the same extent, while they were invariably fully occupied with telegraph and telephone poles, so that the only way of getting over the difficulty would be by bunching the wires or putting them into wooden troughs. It was surprising to find in many places how difficult it was to get even 10 or 12 ft. at the side of the track with the assurance that the space would not be later required for other traffic without widening the line, so that if they took the transmission of the current for, say, 100 miles, as suggested by the author, on a three-phase cable for transmitting alternating currents, or two cables underground, and carried in such a way that they were not going to be damaged, the cost was very considerable. If it was possible to use the earth as suggested, it was a very great advantage on the side of the direct-current system. He drew attention to the fact that there was liability of interference to signals from stray currents, and it was impossible to use anything else but direct current, supplied by primary or secondary batteries, at 2 or 4 volts, and he asked Mr. Highfield if he could give assurance that such small voltages were not likely to be interfered with by such an earth return as was put forward. He also asked if Mr. Highfield had considered the use of sub-station machinery for charging batteries in parallel and also in series.

MR. ROSENBERG (Manchester) held that they could have a very much more simple station and sub-station in the case of alternating currents. He thought there were too many complications, and there might be trouble with governors.

PROF. MARCHANT (Liverpool) spoke chiefly of corrosion. While not suggesting that in the cases quoted there was more than usual corrosion, he suggested that in pipes already laid, that was a serious point.

MR. WIGHAM (Edmundson's, Ltd.) said that in the Highlands of Scotland there were many falls, from which, by the expenditure of a comparatively moderate capital, they might get anything from 2,000 to 5,000 H.P. His experience was that there was no more difficult undertaking than the handling of D.C. machinery.

MR. B. WELBOURN (B. I. & H. Cables) said that the Thury system had received serious consideration in the United States and Canada, and there was a large field for D.C. transmission; the introduction of the system had led to a vast amount of research on the part of cable manufacturers, from which valuable results had accrued.

PROF. BAILY (Edinburgh) pointed out the ease with which the earthing system could be carried out in the vicinity of London, where the sub-soil was water-laden, compared with places with dry stoney sub-strata, like some districts in Scotland.

MR. M'WHIRTER (Glasgow) dealt with the same topic, instancing a case where in the installation of a lightning conductor a series of copper plates had to be laid around the house to secure safe conductivity.

The CHAIRMAN (Mr. Ferranti) spoke of an occasion when his company were conducting on the single line and earth principle when there was a breakdown, and it was reported that atmospheric conditions had been responsible for the resulting interruptions to telegraphs in the neighbourhood of London.

In reply, MR. HIGHFIELD argued that there were frequently occasions when the transmission lines should be laid underground, as in his opinion the line overhead might often lead to a great deal of interference with traffic. He thought the charging of batteries would not be sufficiently effective, and would be somewhat complicated. It was interesting to note that the building of generators such as had been described had resulted in the construction of parallel working direct-current motors at a much higher pressure than hitherto. Mr. Rosenberg was not quite right in the assertion that the machinery was complicated. The author had taken a number of engineers over his plant, and they were surprised at the little there was to see. There was an emergency governor on the motors to come into action in case the plant showed an indication of running away. He agreed with the remarks as to the water contained in the sub-soil around London, but pointed out that they had sometimes to resort to pouring water down the wells to give good conductivity.

THE I.E.E. SUMMER MEETING.

THE first summer meeting ever held by the Institution of Electrical Engineers has come and gone. Glasgow was chosen for the convention, and certainly from an engineering point of view, no place could have been more appropriate. In that busy hive of industry, engineering of practically every kind may be seen in its most advanced, most aggressive and most pronounced character, and to London men Glasgow and its neighbourhood must have formed an object lesson not easily to be forgotten.

Everything must have a beginning; a good start has been made, and each succeeding year should see the summer meeting of the I.E.E. achieve greater and greater success and become more and more useful to our profession.

We understand it was an open secret that the visit was in danger of being abandoned from lack of support, but luckily a sufficient muster of members came to the rescue, and the Institution was enabled to carry out its intention in a manner which did it infinite credit, and which is deserving of the congratulations of all those who took part therein.

The number present was about 155, including ladies, in addition to a goodly number of members and friends of the Scottish Section. As many as 220 took part in the various excursions on the Wednesday. The Council was represented by 10 of its members.

Mr. Highfield's paper, "The Transmission of Electrical Energy by Direct Current on the Series System," was of much importance, but as the subject is little known except to a few, the discussion, although animated enough, did not lead to any further elucidation of it. Dr. Rosenberg criticised it adversely from many points, but as he, apparently, had not seen the system in operation, he brought into his comments a certain number of disadvantages which in reality have no existence, as Mr. Highfield showed in his reply.

It seems not a little strange that the contractors for the plant should not have had a representative present to participate in the discussion, as we know that more than one of their engineers are quite familiar with the Thury system; the cable-makers were not so reserved, Mr. Welbourn for his company making out a good case.

But the feature of the meeting was the lecture on "Permanent Magnets," at the University on Thursday morning, by Prof. Silvanus Thompson. His audience consisted of some 70 to 80 of the sterner sex athirst for knowledge, and some five or six ladies. The majority of the I.E.E. had, alas! gone on a trip to Edinburgh, and therefore lost what would have been a never-to-be-forgotten event in their lives. For two hours, Prof. Thompson held his hearers absolutely fascinated by his usual masterly exposition of his subject.

Many of us probably thought we knew a good deal concerning the properties of permanent magnets, but not one of us left that lecture without a feeling that in those two hours he had learned that which he never knew before.

The quality of steel, the shape and dimensions of bars, heat treatment, magnetising, maturing, and safeguards for preserving; these were the heads of the Professor's discourse, and never have we heard him to greater advantage. He was always eloquent, but at times he became impassioned, probably feeling that he was speaking in the place that had so often been occupied by that greatest of modern physicists, Lord Kelvin, to whose memory he paid a glowing tribute. That lecture alone was well worth the journey to Glasgow, and when we say that Dr. Thompson travelled all night on Wednesday to deliver his discourse at 10.30 the next morning, and then left for London by the 2 o'clock train, we think that the Institution owes him a debt of gratitude.

It may be questioned whether afternoon visits to works, covering acres of dusty, dirty shops, and dustier, dirtier ground, or to power stations are really of much value. And when a tiring afternoon is followed by a reception, there is on the part of the weary ones a decided disinclination to go to the trouble of attiring themselves for evening functions when the time for that and dinner is very limited.

We have every respect for those firms who so obligingly open their workshops to the visitors, but it is becoming a matter for consideration whether, after a morning devoted to the reading and discussion of papers, the afternoon should not be solely devoted to social amenities.

The trip on the Clyde was undertaken in weather not calculated to bring the beauties of the scenery before the visitors to the best advantage; for although the rain which fell in Glasgow did not affect the river party, the sunshine was only fitful. Still, the catering was good, and everybody seemed thoroughly to enjoy the change from arduous labour to pleasure seeking, and as they returned to Glasgow punctually at 5 o'clock, there was ample time left to prepare leisurely for the Institution dinner at the Grosvenor Restaurant, at which some 200 ladies and gentlemen assembled. Amongst the guests were representatives of the Corporation and the University, besides other public men. Dr. S. Z. de Ferranti, the president of the Institution, presided, and among the gentlemen present were Lord Inverclyde, Sir John Ure Primrose, Bailie J. C. King, Chief Magistrate, Sir George T. Beatson, Sir David C. M'Vail, Prof. A. Barr, the Very Rev. F. L. Dean, Provost of St. Mary's, Bailie Nelson, Prof. Glaister, ex-Bailie Willock, chairman of the Corporation Electricity Committee, Prof. Mellanby, Prof. G. G. Henderson, the Rev. Dr. John Smith, Mr. E. Hall Brown, Prof. Andrew Gray and Dr. David Murray. The croupiers were Prof. F. G. Baily, Mr. W. W. Lackie, Mr. W. Judd, Mr. W. Duddell, Mr. Robt. Kaye Gray and Mr. W. M'Whirter.

The chairman proposed "The Corporation of Glasgow," and spoke of the intimate tie binding the Corporation and the Institution—the object of promoting a wider and more general application of electricity for all purposes. The Institution, he continued, was fortunate in having met in Glasgow, where the Corporation had pursued a most enlightened policy of doing all that was possible to push the development of electricity.

Mr. Ferranti then spoke of the labour unrest which permeated almost every trade in the country. There was, he said, a great deal of legitimate dissatisfaction in the life of the greater proportion of the people, and a great deal they would like to see altered. There was, he would not say one remedy only, but one remedy that stood out clearly, if the general mass of the people were to have a better time. He held, and felt very strongly, that the solution of much of the trouble was the introduction of machinery to lighten labour. The country must work at a higher efficiency. His point of view was that electricity was the greatest labour-saving contrivance which had ever been introduced, and that when properly developed it would bring immense benefits in the future to the people of this country.

Bailie King acknowledged the toast, in the absence of the

Lord Provost, in a richly humorous speech. No longer would anyone hearing Bailie King believe that a surgical operation was necessary to make a Scotsman see a joke; they not only see them, but manufacture them at every opening.

Mr. Duddell, the President-Elect of the Institution, gave the toast of "The University," to which Prof. Barr replied in a speech full of witticisms, his references to short and long bars showing how much he had appreciated the lecture on "Permanent Magnets" earlier in the day.

The University, he said, deserved to be toasted at any dinner of electrical engineers, for, as they had been reminded, it was the University of Black and Watt, of Kelvin and Rankine. The physics taught in the early times must have been of a very speculative character, because the old records told them that one branch of the subject was pneumatics, in which was comprised the nature of spirits, including angels. The present learned Professor of Natural Philosophy would hardly venture to go so far in his lectures, but he could wish he had listened to some lectures on that interesting view of the subject, as then, perhaps, he might have been able to estimate the real unearthly nature of the electrical engineer. He looked upon him as being quite ethereal—someone quite outside the common run of engineers, the common five-eighths, as they were usually called.

Lord Inverclyde replied for "The Guests," proposed by Mr. Robt. Kaye Gray. To him as a ship-owner, he said, it was a special gratification to attend their dinner, because although the propulsion of ships by electricity was still in its infancy, the application of electricity to lighting and to other contrivances on board ship had done more to make travel pleasant and convenient than anything else they could refer to.

The toast of "The Chairman" was proposed by Sir John Ure Primrose, and cordially pledged.

The indefatigable secretary, Mr. Rowell, and his *fidus Achates*, Mr. Tree, were here, there and everywhere; we received many little courtesies at the hands of these gentlemen, and to them we offer our salaams.

To the business man it is rather unfortunate that this meeting, the Convention of the M.E.A. and that of the Light Railways and Tramways Association, should all take place within three weeks, for the tax upon one's time is very severe.

In our "Notes" last week we gave a brief outline of the proceedings on the first day of the convention. The second day's meeting took place in the James Watt Laboratory of Glasgow University, Dr. Ferranti presiding, when Prof. Silvanus P. Thompson, D.Sc., F.R.S., lectured on "The Magnetism of Permanent Magnets." In an introductory reference to Lord Kelvin's work, Prof. Thompson said the deceased scientist did so much, not only in regard to magnetism, but as to the allied parts of the science, as to make them all keenly feel that they owed a great debt to him, and that his writings were still an inspiration to them. The lecturer proceeded to point out that the magnetism of permanent magnets was a subject which interested electrical engineers more than others, and he had some doubt whether the majority had really understood the true importance of the subject. Permanent magnets were used in very many pieces of apparatus and very many instruments, and while they had known magnets from their boyhood, they hardly yet realised what advances had been made, what problems confronted, investigated and solved by their agency. They hardly understood the later developments of the subject, but he ventured to think that if one collected the scattered data of the researches of the past 20 or 25 years and put them into a connected whole, the influence of the permanent magnet on the present state of matters electrical would be found to be of vast importance. He would deal not with his own researches, but with what had been done by people in this and other countries. In the first place it went without saying that they had to deal with steel, for there were no permanent magnets for ordinary purposes, except those made of steel. Of course, there were also load-stones, but these could be dismissed from the present occasion, as could also be a material lately discovered—an alloy of cobalt and iron which had not been sufficiently investigated. These they would dismiss and confine themselves to steel. But in that connection there were half a dozen points of view which it would be well to discuss. He put down first in order of consideration, the consistency and the quality of steel. Were they to use carbon steel, and, if so, of what percentage, or if they were to use an alloy steel, what alloy, and of what percentage? That was a point which could not be answered right off, and they had also to consider the second, viz., the shape and dimensions of the magnet. They had then to consider the purely metallurgical question. Steel might differ very largely in its condition, depending upon how it had been heated, cooled, or worked, the temperature at which it had been tempered, cooled, or quenched, in hot or cold water, in oil, or mercury, or liquid air. This was a most important question. Another point was whether it was advisable to temper the steel. Then came the question of magnetising, which was the least important, and that of ageing or maturing, whether by time or shock, or by warming and maturing by repeated partial magnetisation. What was important to know was, how much magnetism was lost and how much residual magnetism left? The professor proceeded to discuss in detail the properties, metallurgical and magnetic, of the various kinds of steel and alloys, with profuse diagrams from the research data of Madame Curie and others, and went on to show that steel heated about 800° C. was non-magnetic. It was not attracted by a magnet and they could not make a magnet of it. A little below that it was capable of being magnetised. Of the various steels he suggested pearlite as the most easily magnetised and the most retentive of magnetism. Proceeding to deal with the dimensions and size of magnets, the lecturer pointed out that Lord Kelvin had told him the better part of 40 years ago that short bars had short memories. They did not remember having been magnetised and gradually lost their magnetism, while long bars, even of soft steel, would remember and would keep it. The self-demagnetising forces in a short bar were greater than in long ones; the nearer the poles were to each other, in the greater degree did the one act upon and combat the influence of the other. His point was that the distance between the poles should not be less but much more than 20 times the diameter or the thickness of a bar magnet, while as to permanence he suggested sudden quenching at the degree he had previously mentioned. In subsequent processes there were various methods, that of dropping the magnet or subjecting it to force, or successive warmings to temperatures of 60 down to 20 degrees—temperatures to which it was likely to be subjected when in ultimate use. He repressed a passing regret that the disappearance of big horse-shoe magnets had synchronised with the passing away of the tea clipper ship, pointing out that such magnets were at one time used for the discovery of nails and other metallic substances which might have found their way into the tea chests. Magnets were now, however, in much greater demand, particularly in those horrid little telephones the Post Office had foisted upon the country, and magnetic steel was therefore in great request. He considered that this was an opportunity of which Sheffield steelmakers should take more advantage. He noticed that recently 300 tons of such steel, at £60 a ton, had been supplied by a foreign firm. He thought the Sheffield makers had not shown their usual keenness in this connection. He admitted, in conclusion, that while they had learned much from improved metallurgical methods, a great deal yet required to be done in the perfecting of their knowledge in this matter. Prof. Thompson subsequently showed a variety of magnets of different shapes and strengths for different uses.

The chairman expressed his confidence that the facts of the lecture would greatly help on what he would term the permanent magnet business. Dr. Thompson might have given them some information, however, as to the applications of such magnets. It was a matter of wide interest, and anything that could be done to stimulate the better production of magnets must be of the greatest advantage to the general development of electrical work.

After Prof. Thompson had been thanked, Messrs. J. S. Nicholson and B. P. Haigh gave a demonstration and description of a single-phase motor with pole-changing windings, in the laboratory, to which we have already referred in our previous note.

In the course of the day a party of the members visited Edinburgh, under the direction of Messrs. E. George Tidd and W. F. Mitchell, while there were visits to the Glasgow Corporation power stations at Pinkston and at Port Dundas, under the guidance of Messrs. W. W. Lackie and John Ferguson; the North British locomotive works, and the Corporation electricity substation at Springburn, with Mr. Sam Mavor as guide; to the Clyde Valley Co.'s power-house at Motherwell, under the direction of Mr. David A. Starr; and to Messrs. Babcock & Wilcox's works, at Renfrew, with Mr. J. K. Stothert as guide.

In the evening the members were the guests of Sir Donald and Lady McAlister, Prof. and Mrs. Barr, and Prof. and Mrs. Milligan. A musical programme was afterwards rendered, while a demonstration of gyroscopic apparatus was given in the Randolph Hall by Dr. J. G. Gray and the assistants in the Natural Philosophy Department.

On Friday the members enjoyed a cruise on the estuary of the Clyde, and later dined in the Grosvenor Restaurant, under the presidency of Dr. Ferranti. In proposing "The Corporation of Glasgow," the Chairman spoke of the T.C.'s intimate association with the tramways and electricity supply as a binding tie between the Institution and the Corporation. He did not feel at all shy of speaking of the Corporation pushing the use of electricity. They might think it too commercial a thing for a municipality to do, but it was not. He felt there was nothing they could do more beneficial to their citizens and to the trade of the city than to push electricity as much as they possibly could. He suggested that the country must work at higher efficiency, and his opinion was that electricity was the greatest labour-saving contrivance which had ever been introduced, and that when properly developed it would bring immense benefits in the future to the people of this country. Bailie King acknowledged the toast in the absence of Lord Provost Stevenson, and in responding for the toast of "The University," proposed by Mr. W. Duddell, Prof. Barr, after recalling the association with the University of Black, Watt, Kelvin and Rankine, said the subjects which the University taught to-day were quite as exten-

sive as they ever were. He thought they professed to be able to teach almost everything, but if they could think for one moment of the most characteristic element of all that teaching, he would say it was they were trying to teach them how they could get 9d. for 4d. In replying to "The Guests," Lord Inverclyde said that the application of electricity to lighting and to other uses on board ship had done more to make travel pleasant and convenient than anything else that he knew of.

LEGAL.

British, Foreign and Colonial Automatic Light-Controlling Co. and Gunning *v.* Metropolitan Gas Meters, Ltd.

This case came before the Court of Appeal, composed of the Master of the Rolls and Lords Justices Farwell and Kennedy, on Tuesday and Wednesday last week, upon the appeal of the plaintiffs from a judgment of Mr. Justice Warrington.

In this case the plaintiffs brought the action for an injunction to restrain the defendants from infringing the plaintiffs' letters patent of alleged improvements in apparatus for automatically lighting and extinguishing lamps, both gas and electric light, at predetermined times, and for improvements in conical plugs, with the object of doing away with the necessity of hand lighting.

It appeared that the plaintiffs' apparatus, so far as it related to gas, was the use of a stop-cock with passages through its plug, so that on turning it partly round the gas could pass, and on turning it another stop round the passage was closed, there being, however, a small by-pass to maintain a kindling light. When the lamps were electric a rotating switch was employed which when turned partly round closed the circuit, and when turned a step further opened it. The turning movement of the stop-cock or switch was effected by means of clockwork which would go a week with one winding up, and parts of the clock were adjusted to act on the stop-cock or switch so as to partly turn it at the hours to which the parts were adjusted. Plaintiffs contended that the combination of these things produced a new result, and that the defendants had been guilty of infringement. Mr. Justice Warrington, however, held that there had been no infringement by the defendants, and entered judgment for them with costs. Hence the present appeal of the plaintiffs.

Mr. T. Terrell, K.C., Mr. Courtney Terrell, and Mr. Goodland appeared for the appellants; and Mr. Walter, K.C., and Mr. J. H. Gray for the respondents.

At the conclusion of the arguments, their Lordships upheld the decision of Mr. Justice Warrington that the defendant company had not infringed the plaintiffs' patent, and dismissed the appeal, with costs.

Tramway Accident Compensation.

A carman named Lingi Rouchetti, of Battersea, employed by Messrs. Carlo Gatti, ice merchants, on June 12th, was awarded, in the King's Bench Division, by a common jury sitting with Mr. Justice Horridge, £50 damages against the London United Tramways, Ltd., for personal injuries sustained by a collision with a tramcar belonging to the defendant company in July last.

Simpson *v.* Lord and Others.

Before Mr. Justice Bucknill, at the Liverpool Assizes on June 13th, Mrs. Annie Simpson, of Birkenhead, sued Wesley Sutton, Samuel Lord and John Wm. Garsden, formerly trading as the Howe Electrical Engineering Co., Ltd., of 18, James Street, Liverpool, for money lent and interest.

Mr. Hugh Gamon, for plaintiff, said the claim was for £1,118, made up of £930 principal and £188 interest.

In the course of Lord's evidence, it transpired that plaintiff was his sister, and had advanced various sums amounting to £930, up to 1909, to the Howe Electrical Engineering Co. It was agreed by the partnership that plaintiff should be paid interest at the rate of 5 per cent. per annum.

Judgment was given for plaintiff, for the full amount, with costs.

Braulik *v.* Mitchell & Co.

In the City of London Court on 14th inst., before Judge Rentoul, K.C., plaintiff, of 8, Lambeth Hill, sued Messrs. Fred Mitchell and Co., electric contractors, of Ardwick, Manchester, for £14 8s. 10d. for electric goods supplied. Defendant, Mr. Mitchell, complained that the plaintiff had overcharged him in many instances. For instance, he had been charged 6s. for electric lamps when the traveller who took his order agreed to supply them at 4s. 6d. Plaintiff's representative said that the price of the lamp was 8s., and a discount was allowed off that of 25 per cent., which was the sum everyone in the electric lamp trade had agreed to. It was ridiculous for the defendant to suggest that he should have them for 4s. 6d. Their traveller, who had no authority to make such terms, had left their service. Defendant said if the traveller had not had important work in Liverpool he would have been present in court to support his (defendant's) case.

Judge Rentoul said he would not have thought much of the evidence of a former traveller if he gave it against the interests of his former employer. As the traveller was not there the plaintiff must put up with the deductions. He (the Judge) was not supposed to know anything about business, but he frequently had travellers offering him goods for next to nothing. Unfortunately merchants were in the hands of their travellers. In his view employers ought to get some guarantee from the men whom they appointed and then let loose on the country. It should be some security to fall back upon to meet cases like the one before him. They were constantly coming before the Court. Defendant might be quoting the correct figures, but the plaintiff was at his mercy. He found for the plaintiff for £9 16s. 6d. and costs. Plaintiff's representative had done his best in the conduct of the case. Plaintiff should be more wise in the selection of his travellers.

Herbert Morris, Ltd. *v.* Richard Miles.

In the Chancery Division, last week, Mr. Justice Swinfen Eady had before him a motion in this action to restrain defendant from committing a breach of agreement entered into by him when in plaintiffs' employ.

Mr. Miles appeared in person.

The motion asked that the defendant should be restrained from carrying on either as principal or agent, or employé, the business of electrical overhead travelling cranes, manufacturer or maker of pulley blocks, runways, or conveyors, or be concerned in any such business contrary to an agreement dated June 1st, 1910.

Mr. Micklem, K.C., appeared for the plaintiffs, and stated that the defendant entered into the agreement under which he was to be employed by plaintiffs at a salary of £3 a week, subject to a fortnight's notice on either side, as engineer and salesman. Plaintiffs were one of two or three firms which made electrical cranes and lifting machinery. It was a limited trade, but the plaintiffs' business was world-wide, and they had branches practically all over the globe. The agreement in question in its terms called upon defendant not to divulge any of the secrets of plaintiffs' business or impart a knowledge of their business acquired whilst in their service, and restricted him from carrying on the same trade, &c., for a period of seven years after leaving their employ. Defendant was employed in the Swansea district for a time, but the company found it necessary to transfer him to Manchester. He objected to this, and told plaintiffs that if they persisted in their decision he had no option but to seek employment elsewhere. Defendant left plaintiffs' employ in February of this year on his own motion, and immediately afterwards entered that of plaintiffs' chief rivals, Messrs. Vaughan & Sons, Ltd., of Manchester. The fact that defendant had done this was brought to plaintiffs' knowledge by their coming in contact with him in connection with contracts for the erection of electric cranes.

In answer to his Lordship, Mr. Micklem said plaintiffs' works were known as the Empress Works, London. They also had a large factory at Loughborough, employing over 600 hands. There were few firms engaged in the business, and the trade for overhead travelling cranes was practically confined to themselves and Messrs. Vaughan & Sons.

On his own behalf, Defendant alleged that the agreement was too wide, because, if bound by it, he would be debarred practically from getting his living as an engineer. All engineering firms manufactured some part of the machinery made by the plaintiffs. He denied that he left plaintiffs of his own motion. When he went to Manchester he wanted another £1 a week, but he was given to understand that if he demanded it he could "clear out." He did do so, and was asked for his keys.

In answer to his Lordship, Defendant admitted that for some eight years before entering plaintiffs' service he had been engaged with a firm at Aberdare, who, of all the machinery mentioned in the restrictive covenants, only made parts of conveyors.

His Lordship, in giving judgment, said he thought if plaintiffs would omit the word "conveyors" from the agreement, they were entitled to the injunction asked for. With that omission the agreement was not too wide.

Mr. Micklem agreed to do this, and his Lordship, with that amendment, granted the injunction asked for.

Defendant asked when the injunction would come into operation.

His Lordship: At once.

Defendant: Then I am out of employment.

His Lordship said defendant must endeavour to obtain employment outside the scope of the agreement as speedily as he could.

The Telephone Arbitration.

(Continued from page 959.)

Mr. Gill explained in great detail what he called his priced inventory. Dealing with underground plant, he said that there were throughout the country 3,428·6 miles of ducts for carrying the underground wires, and he estimated the cost of constructing this portion of the plant at £2,840,000.

The Solicitor-General objected to a mass of calculations being given without a single detail as to the price of the articles.

A long discussion followed on this point, and eventually Sir Alfred Cripps produced a letter from Sir Robert Hunter, solicitor to the Post Office, which stated that the Post Office authorities'

estimate of the value of purchasable conduit plant was £1,429,910, and the depreciated value was £1,083,021.

SIR JAMES WOODHOUSE (to Sir A. Cripps): There is a difference of 1½ millions, and you will have to establish that. I wish to appreciate what the company are seeking to establish, and should be greatly assisted if the company would supply the Court with tables showing the details of the items which made up the total sum.

The SOLICITOR-GENERAL stated that when the Post Office authorities had been able to consider the details asked for he would be able to indicate the figures to which no objection was taken.

In answer to other questions, the WITNESS gave the percentages he allowed for various services as follows: Two per cent. for contingencies; 5·1 per cent. for interest on capital during construction, and 4·44 per cent. as the cost of raising capital, the last being the percentage actually paid by the Telephone Co.

MR. GILL having concluded his evidence with reference to the item of £2,839,742 in respect of the underground conduits,

SIR J. SIMON suggested that this item should be disposed of before taking the next in the company's claim. Such a course might probably save time, and they could then arrive at a true conclusion with regard to the principle for dealing with other items.

It being considered that the suggestion was of great importance, it was ultimately arranged that the case should be adjourned until later in the day to enable counsel for the company to consult with their clients on the matter.

On the Court resuming after the adjournment, SIR A. CRIPPS said that at first he thought the Attorney-General's suggestion was a good one, but on further consideration they had come to the conclusion that it was not practicable. They felt that the case ought to take its natural course, which in the end would be found to be the most convenient. There were several heads of claim dealing with plant which contained elements of similarity, but the applicants would ask for a lump sum for valuation of the plant.

The ATTORNEY-GENERAL said that the P.M.G. would object to a judgment being given for a lump sum for plant as Sir Alfred Cripps suggested. There would be many instances in which it would be necessary to give separate judgments, for various reasons.

MR. GILL then proceeded to give further evidence with regard to underground plant. Dealing with the item of cables, he said the estimated cost of construction was £3,276,664, and the value on December 31st, 1911, was £3,186,582. Under the word "cable" he included all the necessary material, viz., the actual cable, petroleum jelly, calcium chloride, &c. Continuing, witness mentioned an item of £2,614,444 for poles and standards, and stated that the number of standards claimed for was 422,779. The cost of an ordinary creosoted telephone pole was placed at about £1 in the valuation.

WITNESS next dealt with an item of two million pole steps at a valuation of £83,000. Having dealt in detail with an item of £1,017,000 for aerial cables, the quantities in the large items making up the total, he said, were agreed to by the Post Office, and the smaller items which were not agreed were, in his opinion, correctly valued. With regard to exchange equipments, witness said that some of the larger exchanges had been valued one by one. There was no method by which they could value exchange equipment generally.

SIR A. CRIPPS said he would not question witness closely as to the details under this head, but would call Mr. Cook, who had an intimate knowledge of the matter, later on. He hoped, however, before Mr. Cook was called, some agreement would be arrived at which would tend to shorten the inquiry before the Court.

MR. BUCKMASTER said he agreed it was of the utmost consequence that what could be agreed upon outside should be agreed. The Post Office had always been willing to do so, but it was not until the company's witnesses were called that they could examine the cost of material.

SIR ALFRED said Mr. Cook would not be called for some time yet, and in the meantime something might be done.

MR. JUSTICE LAWRENCE suggested to Mr. Buckmaster that the gentleman in charge of the exchange equipment for the Post Office should meet Mr. Cook and see how far they could agree.

MR. BUCKMASTER promised that this should be done. There was no desire on the part of the Post Office to prevent these figures being agreed.

Mr. Gill's examination in chief having concluded, MR. BUCKMASTER, K.C., proceeded to cross-examine witness, and in answer to his questions, WITNESS said he had endeavoured to ascertain the cost of preparing and constructing the plant and apparatus of the company as it existed on December 31st, 1911. He had made allowance for depreciation, owing to the fact that the plant was not new. Taking all the factors into consideration, Mr. Gill agreed that if it were possible to ascertain what would be charged by the contractor for the construction of the plant, that might be the best and surest method of ascertaining the first item of witness's figures, but of course the contractor's price would be affected by the state of the copper market or the labour market on a particular day, and therefore it would be an unreal estimate to fix the price as at December 31st, 1911.

MR. BUCKMASTER: You think the contractor's price is not what the contractor would charge on December 31st, 1911, but it would be the cost of building up the concern during the whole period the company had it?—No, I take the cost of building up the concern during a portion of the period the company had it, in order to give the best representation I can arrive at of what it would in fact cost to replace the plant.

MR. BUCKMASTER: I understand the difference between us is this You say the cost is to be determined by considering what it has cost the company during the 11 years to build up the plant. I am suggesting that it should be determined by the price the contractor would give for it on December 31st, 1911?—I do not say my price is to be determined by what it had cost the company. I say the price is to be what it would cost to construct and establish the plant, and the best guide I can get in certain particulars is by reference to what it has cost the company.

WITNESS denied that his figures represented what the plant had, in fact, cost the company during the period of its construction. There were certain points at which he had made additions.

SIR JAMES WOODHOUSE said he understood Mr. Gill to say that if he were a contractor called upon to construct that plant he would know a period of years was required for the construction, and from that point he would bear in mind the fluctuations in the market as to the cost of materials and labour, and he would base his calculations accordingly?—WITNESS: Quite right.

MR. DANCKWERTS said that the company's point was that it would take 12 years to construct the plant, and the price was what the contractor would charge on completing the work on December 31st, 1911. The Post Office authorities put out a contract on December 31st, 1911, to be completed at some future time.

WITNESS, further cross-examined, said that after consideration he had come to the conclusion that 11 years would be a fair period to take for the construction of the company's existing plant.

Cross-examining with regard to the estimate of freight charges, MR. BUCKMASTER pointed out that there was a big discrepancy between the company's figures and those of the Post Office.—WITNESS: I can only say your figures are not true. Further pressed, he said he could not explain the difference.

MR. BUCKMASTER was still continuing to question witness on the point, when SIR JAMES WOODHOUSE, interposing, said the Court knew a great deal about freight charges, and that often an agreement in cases of difference might very simply be arrived at. It might be that by pursuing the matter, counsel was simply pursuing a mare's nest.

MR. JUSTICE LAWRENCE said that what Sir James was suggesting was the desirability of the parties ascertaining what their quotation stood for, in order to be quite certain that they were disputing the same thing. It might be that, in one case, the quotation was for station to station charges, whilst, in the other case, it might be from station to station plus cartage of goods from works to station.

SIR JAMES WOODHOUSE: Exactly; that is the thing you had better clear up.

(To be continued.)

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Witton-Kramer Fatigue Tester.

The system of testing materials for fatigue patented by Prof. Kapp, and described in our issue of January 12th, 1912, has been put into commercial form by the Witton-Kramer Electric Tool and Hoist Co., for whom the GENERAL ELECTRIC CO., LTD., are the sole selling agents. As already explained, the loading

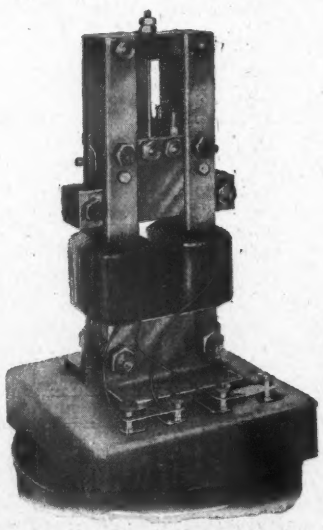


FIG. 1.—WITTON-KRAMER FATIGUE TESTER.

of the sample is effected by the attraction of an electromagnet on its armature: one end of the sample is held in the frame of the machine, and the other supports the armature at a short distance from the polar faces. An alternating current is passed round the electromagnet, producing stresses at twice the frequency of the current, which may be of any desired value. The magnitude of the stress can be regulated by adjusting the voltage applied to the magnet. At 50 cycles per second, 360,000 stresses are applied to the sample in an hour, so

that a test is carried through in a comparatively short period. If the material yields to the stress, the armature rattles on the poles, giving an immediate indication of the fact. By using two-phase current, alternating stresses can be applied.

Two samples may be used, only one of which is treated in the machine; after the desired number of stresses has been applied, both samples are tested in an ordinary testing machine, and by comparison the effect of the treatment can be inferred. Alternatively, a sample may be tested to destruction in the fatigue tester. The power consumed is trifling, and practically no attention is required; the time of application at a known frequency gives at once the number of stresses applied, without the aid of any counter.

G.E.C. Rotary Converter with Booster.

The accompanying illustration, fig. 2, shows a 300-KW. 50-cycle six-phase rotary converter with self-contained synchronous booster, supplied by the GENERAL ELECTRIC CO., LTD., to the Yorkshire Electric Power Co. The supply is three-phase at 10,000 volts, and is converted by transformers to six-phase current at 340 volts for lighting and 390 volts for power, these being the voltages on the A.C. side of the converter. The normal lighting and traction voltages on the D.C. side are respectively 480 volts and 550 volts.

Starting is effected by a three-phase six-pole slip-ring motor coupled to the end of the main shaft, the converter and booster having each eight poles. The converter field is shunt-wound only and self-excited, but the booster field has both shunt and series windings, which are respectively used for lighting and traction service. The normal D.C. voltage for lighting is 480 volts, but with the booster shunt excited the voltage can be regulated plus or minus 20 volts, *i.e.*, from 460 to 500 volts.

When the converter is on traction service, the series winding only is used, and varies the terminal voltage from 550 volts at no load to 580 volts at 100 per cent. overload.

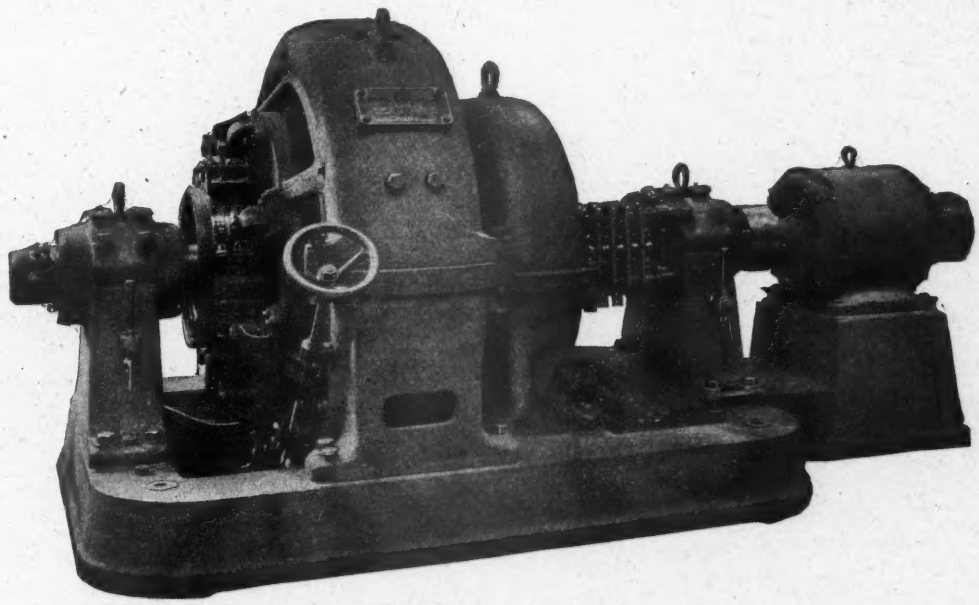


FIG. 2.—G.E.C. ROTARY CONVERTER FOR LIGHTING AND TRACTION.

The W.E. Combined Telephone Signal Lamp and Relay.

As is now generally known, the electric glow lamp plays a very important part in the modern central-battery telephone switchboard as used in telephone exchanges, the signals to the operator being given by this means. It has been the practice up to the present to place the operating relay for the lamp separately at the back of the switchboard, but recently the need arose for a single unit lamp and relay for the smaller telephone switchboards and certain telegraph circuits, and this has been met by the WESTERN ELECTRIC CO., LTD., of North Woolwich. As a large number of lamps must be mounted close together, each associated with its corresponding spring jack, mounting space is extremely limited, and the necessary great reduction in the size of the relay calls for considerable ingenuity.

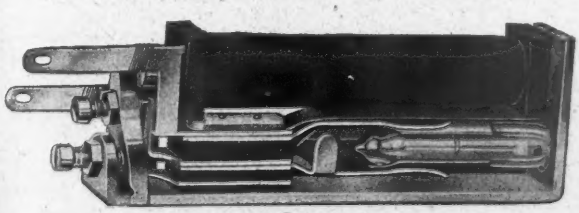


FIG. 3.—W.E. COMBINED SIGNAL LAMP AND RELAY.

Fig. 3 shows the neat arrangement of the lamp, lamp socket and relay in one frame, which will mount at ½-in. horizontal and 1-in. vertical centres, and is no longer than an ordinary switchboard jack. The glow-lamp is held in the contact springs at the bottom, and a piece of sheet fibre shades one side of the lamp, so that its rays do not interfere with the signal immediately adjacent. The armatures are of new and improved design. One pattern is made for telephone circuits; its relay is wound to 1,000 ohms, operates on 6 milliamperes, and releases on 1 milliampere. Another is for the telegraph circuit, and is wound to 100 ohms; with a fine adjustment of the armature it operates on 10 milliamperes, and with a coarser adjustment on 35 milliamperes, this meeting the requirements of the circuit. The modified armature employed permits of the wide adjustment required. By means of a suitable winding, satisfactory adjustment can be obtained on an operating current of 2 to 3 milliamperes. Ten or 20 combined relays are usually mounted together on one plate or alternately with spring jacks to the number of 20.

High-Pressure Direct-current Instruments.

In connection with the description of the 100,000-volt direct-current transmission system of the Metropolitan Co., contained in our last issue, mention was not made of the fact that all the measuring instruments for working at this voltage were manufactured by MESSRS. EVERETT, EDGCUMBE & CO., LTD., of Collindale Works, Hendon.

The voltmeters are of the moving-coil type the series resistances being oil-immersed and contained in porcelain boxes, suitably subdivided. The ammeters are also of the moving-coil type, and in both ammeters and voltmeters, special precautions have been taken to ensure efficient screening from both electrostatic and electromagnetic effects.

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"H. E. C." writes:—"Since the end of 1909 we have been supplying a 'Picture Palace,' situated on the opposite side of the road to our works, with electrical energy from our own plant by means of overhead cables.

"Our position with respect to the local Council is clear to us, but we would say that there is a company in existence which owns, but does not yet work, a provisional order for the supply of the town.

"We should be glad if you could inform us in what way our position as a 'free lance' is affected by the late Electric Lighting Act with respect to this latter company. Can they prevent us from supplying?"

*** Something depends upon the date when our correspondent *commenced* to grant a supply of electricity to his neighbour in the manner described. The Act of 1909 came into force on April 1st, 1910, and if the supply in question was afforded before that date, it is clear that our correspondent is at liberty to continue it. Sec. 23 of the Act provides that "Where in any area a local authority, company or person is authorised to supply electricity under Act of Parliament, or under licence or provisional order granted under the

Electric Lighting Acts, it shall not, after the passing of this Act, be lawful for any other local authority, company or person to commence to supply or distribute electricity within the same area unless such supply or distribution is authorised by Act of Parliament, or by licence or provisional order granted in terms of the Electric Lighting Acts; provided that this Section shall not prevent any company or person from affording a supply of electrical energy to any other company or person where the business of the company or person affording the supply is not primarily that of the supply of electrical energy to consumers, provided also that this Section shall not prevent any company who at the passing of this Act are empowered by their memorandum of association to generate electrical energy from affording a supply to a railway company for purposes incidental to the company's undertaking other than the conveyance of public traffic." Having regard to the proviso to this Section, and even assuming that supply was commenced since April 1st, 1910, it is reasonably plain that the supply which our correspondent is furnishing can hardly be interfered with by the company when they commence to work their provisional order.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

12,961. "Brush-holder." E. MOSES. June 3rd.

12,966. "Electric safety lamps." J. F. RILEY. June 3rd.

12,973. "Telephone exchange systems." W. AITKEN. June 3rd.

12,974. "Telephone switching systems." W. AITKEN. June 3rd.

12,975. "Branch telephone exchange switchboards." W. AITKEN. June 3rd.

12,979. "Valve fitted to the sand-distributing pipes of either tramway, railway, or road vehicles to prevent water and mud being drawn into the orifice of same." T. C. WINFIELD and S. H. JONES. June 3rd.

12,980. "Electric switches." SIEMENS BROS. DYNAMO WORKS, LTD. (Siemens-Schuckertwerke G.m.b.H., Germany.) June 3rd. (Complete.)

13,001. "Portable electric lamps." H. NEUBURGER. June 3rd. (Complete.)

13,046. "Electric condenser." H. SEFTON-JONES. (F. Jacoviello & Jacoviello Soc. Anon., Italy.) June 3rd. (Complete.)

13,048. "Manufacture of filaments for incandescent lamps." PATENT CORPORATION, LTD., and W. P. THOMPSON. June 3rd.

13,061. "Pendants for gas and electric lights." A. N. HASSELL. June 4th.

13,063. "Instruments for graphically recording the surface contour of track rails, especially applicable for electric car tracks." R. CHADWICK. June 4th.

13,079. "Devices for insuring electrical continuity in metallic conduits for electric cables." L. M. WATERHOUSE and SIMPLEX CONDUITS, LTD. June 4th. (Complete.)

13,080. "Electrical immersion heaters." W. FRISBY. June 4th.

13,098. "Switchboard connecting cords and the like." P. P. CRAVEN. (Addition to No. 11,906, of 1912.) June 4th.

13,111. "Terminals for electric conductors." J. P. ANDERSON and C. E. FRITTS. June 4th. (Complete.)

13,138. "Electro-deposition of metals." S. O. COWPER-COLES. June 4th.

13,139. "Process for the production of fine wires." S. O. COWPER-COLES. June 4th.

13,152. "Portable electric light fixtures." L. A. WILLIAMSON. June 4th. (Complete.)

13,154. "Brakes for trams and similar vehicles." F. VAN DER STRAETEN. June 4th. (Complete.)

13,155. "Electric telegraphy." E. S. HEURTLEY. June 4th.

13,157. "Telephone receivers." A. PLECHER. June 4th. (Complete.)

13,158. "Electrical lifts for dinner or service use." F. HODGSON. June 4th.

13,160. "Spark arresters." O. FROMM and F. WELTZIEN. June 4th.

13,162. "Dynamo-electric machines." E. D. PRIEST. (Convention date, Jan. 18th, 1912, United States.) June 4th. (Complete.)

13,171. "Securing electrical contact with, and continuity of, the wire armouring on electric cables where the cables are joined together or where they are connected to apparatus." A. HEPBURN. June 4th.

13,195. "Electrical switches." A. WYNNE. June 5th.

13,203. "Means for the control of electric pressure and current regulators." W. J. POOLE. (Addition to 28,314, 1910.) June 5th.

13,208. "Electric signalling lamp." H. F. CHAPMAN. (E. H. S. Chapman, India.) June 5th.

13,218. "Polarised electrical receiving instruments." A. HONIG. June 5th.

13,233. "Electro-mechanical propulsion-systems for trains." H. PIEPER. (Convention date, June 27th, 1911, Germany.) June 5th. (Complete.)

13,250. "Method of protecting electrical systems from leakage." ASHINGTON COAL CO., LTD. and T. MCKIE. June 5th.

13,282. "Process for the manufacture of articles of refractory metals and alloys." P. SCHWARZKOPF, S. BURGSTALLER and WOLFRAM-LABORATORIUM. June 5th.

13,287. "Methods of constructing non-conducting coverings, walls or the like." A. J. ROACH-CUMING. June 5th.

13,291. "Electric bells and the like." S. A. BHISEY. June 5th.

13,295. "Induction coil or transformer for the transmission of speech." J. SIMPSON and R. SIMPSON. June 6th. (Complete.)

13,298. "Magnetic compasses." R. KENNEDY. June 6th.

13,300. "Electric lighting systems of the dynamo-battery type." VAN RADEN & Co., LTD., M. METZ and C. SAUNDERS. June 6th.

13,325. "Telephone time indicators." C. M. BERINGTON. June 6th.

13,328. "Electrically-driven developing apparatus, chiefly for writing telegraphs." A. E. RAPPENECKER. June 6th. (Complete.)

13,355. "Systems for the electrical transmission of power and simultaneous telephonic, telegraphic or signalling purposes." P. V. HUNTER and W. L. SHAND. June 6th.

13,358. "Arc lamps." HABLE & CIE. (Convention date, June 15th, 1911, France.) June 6th. (Complete.)

13,365. "Supporting insulator." M. MEIROWSKY. June 6th. (Complete.)

13,375. "Electrodes for arc lamps." BRITISH THOMSON-HOUSTON CO., LTD. (General Electric Co., United States.) June 6th.

13,396. "Dynamo-electric machines for use in electric generative systems of motor-vehicles and the like." B. BROOKS and W. HOLT. June 7th.

13,401. "Insulators for securing and hanging electric flexible cords, wires nd the like." W. SCHOLES. June 7th.

13,415. "Self-contained key panel for semi-automatic telephone exchanges." SIEMENS BROS & Co., LTD. (Siemens & Halske Akt.-Ges., Germany.) June 7th. Complete.)

13,416. "Electro-medical electrodes." SIEMENS & HALSKE AKT.-GES. (Convention date, December 20th, 1911, Germany.) June 7th. (Complete.)

13,425. "Copying or like telegraphic apparatus." A. E. RAPPENECKER. June 7th. (Complete.)

13,428. "Automatic safety catch for electric lines." P. MICHAELSEN. June 7th. (Complete.)

13,430. "Apparatus for selective electric signalling." A. H. NICHOLSON. June 7th. (Complete.)

13,432. "Electrical switch contact devices." W. F. HOSFORD. (Convention date, September 8th, 1911, United States.) June 7th. (Complete.)

13,446. "Electrodes for vapour electric apparatus." BRITISH THOMSON-HOUSTON CO. LTD. (General Electric Co., United States.) June 7th.

13,452. "Bread-making by the electrical stimulation of the fermentation of yeast." W. A. BENTON and W. JONES. June 7th.

13,455. "Electrical switches." A. WYNNE. June 8th.

13,487. "Electric motor." H. L. ZABRISKIE. (Convention date, July 15th, 1911, United States.) June 8th. (Complete.)

13,490. "Receiver for telegraph printing machines." SIEMENS BROS. & Co., LTD. (Siemens & Halske Akt.-Ges., Germany.) June 8th. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

MEANS FOR OPERATING ELECTRIC RAILWAY TRACK POINTS AND SWITCHES. P. M. Justice. (American Automatic Switch Co.) 4,385. February 21st.

TROLLEY BASES FOR ELECTRICALLY-PROPELLED VEHICLES. E. M. Munro and Railless Electric Traction Co. 12,102. May 19th.

AUTOMATIC TELEPHONE INSTRUMENT. S. A. Bhisey. 12,135. May 19th.

CORD-GRIP ELECTRIC LAMPHOLDER. C. E. H. S. Walter. 12,177. May 20th.

COMPOUND OR MIXTURE FOR HARDENING OR PRESERVING OR MODIFYING THE MAGNETIC OR ELECTRIC PROPERTIES OF METALS. J. Vigneault and J. A. H. Hebert. 13,483. June 6th.

PORTABLE ELECTRIC BATTERY LAMPS. B. Pordes. 14,866. June 26th.

ELECTRO-PNEUMATICALLY OR ELECTRICALLY-OPERATED ORGAN OR MULTIPLE-INSTRUMENT PLAYING MECHANISM AND THE LIKE. A. R. Trist. 17,140. July 26th.

ARRANGEMENT FOR AUTOMATIC VOLTAGE REGULATION OF ALTERNATORS, DECREASING THE CURRENT IN CASE OF SHORT-CIRCUIT. T. Lehmann. 18,580. August 12th.

PROTECTIVE DEVICES FOR ELECTRICAL APPARATUS. British Thomson-Houston Co. (General Electric Co.) 19,589. September 2nd.

ARC-RUPTURING DEVICES FOR ELECTRICAL APPARATUS. Allgemeine Elektricitäts Ges. 20,409. September 14th. (September 15th, 1910.)

ELECTRIC CONTROLLERS. H. R. Canfield. 20,584. September 16th. (September 21st, 1910.)

DYNAMO-ELECTRIC MACHINES FOR MINE EXPLODING. Sterling Telephone and Electric Co. (Schaffler & Co.) 21,918. October 4th. (Addition to 22,648 of 1907.)

CONNECTION FOR LIGHTING METALLIC-VAPOUR ELECTRIC LAMPS. Quarzlampen Ges. 23,284. October 21st. (October 22nd, 1910.)

ARC LAMPS. H. Weiss. 25,899. November 20th.

COMMUTATION OF DIRECT-CURRENT DYNAMO-ELECTRIC MACHINES. Siemens Bros. Dynamo Works. (Siemens Schuckertwerke Ges.) 27,212. December 5th.

1912.

ELECTRICAL SELECTIVE CONNECTING APPARATUS OPERATED FROM A DISTANCE. G. A. Betulander. 410. January 6th. (January 10th, 1911.)

ELECTRICALLY HEATED FLAT-IRONS. K. Kaltschmid. 2,521. January 27th.

WINDING METHODS FOR ROTATING MAGNET COILS. "Vulkan" Maschinenfabriks Akt.-Ges. 3,919. February 16th. (February 20th, 1911.)

CIRCUIT ARRANGEMENTS FOR POLYPHASE SERIES MOTORS. Siemens Schuckertwerke Ges. 4,165. February 19th. (February 18th, 1911.)

TELEPHONES. T. W. Tattersall. 4,773. February 26th.

FUSEBOARDS, PANELS AND THE LIKE FOR ELECTRIC DISTRIBUTION. Siemens Schuckertwerke Ges. 5,822. March 2nd. (March 3rd, 1911.)

CONTROLLING ARRANGEMENTS FOR ELECTRIC CRANES. Siemens Schuckertwerke Ges. 8,158. April 4th. (April 12th, 1911.)

Peat as Fuel.—A paper discussing the utilisation of peat as fuel at the power station on the Wiesmoor, East Friesland, was read by Prof. J. Teichmuller at the Leipsig conference of the Union of German Electrical Engineers. The peat is used on the spot for raising steam and the electrical energy is employed in connection with the establishment of the channels necessary for the drainage of the moor so as to render the land suitable for cultivation. The quantity of peat needed for the generation of a kilowatt-hour is stated to amount to 2½ kg. and the cost of production is 1·25 pfennig per KW.-hour, which is said to enable the peat-fired station to compete with one where pit coal is used as fuel. At the beginning the working of the station was favoured by the construction of a large lock which necessitated the use of considerable power, but compensation for this loss of business on the completion of the lock has been obtained, and the total consumption is expected to reach 8,000,000 KW.-hours next year. It is calculated that the peat already raised from the channels which have been made will assure a supply of fuel for from 20 to 30 years, whilst the total available deposits in the district are reckoned to last for 450 years. If the electricity works had not been established there would have been no sale for the peat, and the cultivation of the land would have been generally doubtful, whilst mechanical working could only have been carried out to a slight extent.